

United States Pacific Command

2005

Asia-Pacific
Economic Update



Volume III

U.S. PACIFIC COMMAND ASIA PACIFIC ECONOMIC UPDATE

• 2005 EDITION •

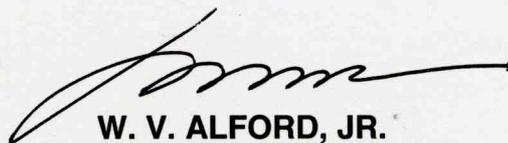
FOREWORD

Welcome to the 2005 edition of the *Asia Pacific Economic Update (APEU)*, our flagship economic document at the U.S. Pacific Command. We have expanded some of our older topics and introduced new ones.

- In Volume I, Northeast Asia, we added the U.S. dollar and Asia chapter to the global financial turmoil section and also included a new section on the rise of China and its shared prosperity.
- In Volume II, Southeast Asia, we added two case studies in the South Pacific.
- Volume III looks at transnational issues. Once again, we have expanded some of our older topics and introduced new ones.
 - We discussed the socio-economic strategy to counter terrorism and how to implement it via creative partnerships with the private sector.
 - We expanded our energy chapter to reflect the increasing importance of energy security in the region.
 - We put a new emphasis on the strategic importance of food and water in Asia and around the world.

In addition, we're introducing a totally new idea in hopes of keeping our readers as well informed as possible by adding periodic daily updates to our baseline studies of individual economies, with informed comments from our economic advisor.

We are pleased to publish the 2005 edition of the U.S. Pacific Command Asia Pacific Economic Update as a military perspective on the seamless web of economic and security interdependence.



W. V. ALFORD, JR.
Rear Admiral, U.S. Navy
Chief of Staff
U.S. Pacific Command

ACKNOWLEDGEMENT

• VOLUME III •

I want to take this opportunity to thank Dr. Leif Rosenberger, the Economic Advisor at U.S. Pacific Command, for his guidance, tutelage and encouragement for this volume. This would not have been possible without his support and mentorship.

A special thanks goes to Mr. Mark Harstad of Asia-Pacific Center for Security Studies for his data and graphic support. Also, I would like to acknowledge Ms. Delia Stoehr of Northeast Asia Policy Division at PACOM, for diligently reviewing all three volumes of Asia-Pacific Economic Update 2005. I would also like to thank Rear Admiral Michael C. Tracy, Director of Strategic Plans and Policy at PACOM, Mr. Edward F. Smith, Jr. of the Institute for Defense Analyses (IDA), and Captain William Stacia (USN), Staff Sergeant Heather Henry, Ms. Kelly Mark of Virtual Information Center (VIC), and Ms. Faith Goodwin, Graphic Designs at PACOM, for their assistance and support. I would like to express my gratitude to the contributing authors of this volume: Dr. Leif Rosenberger, Mr. Mark Harstad, Mr. Richard Bitzinger, Dr. James Dorian, Dr. Kent Butts, and Ms. Delia Stoehr.

Finally, I would like to dedicate this volume of Asia Pacific Economic Update to my husband, Dr. John E. Byrd, for inspiring me and believing in me.

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07 September 2005



United States Pacific Command **BIOGRAPHY**

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Major Byrd has been recalled to active duty and is currently serving as the Deputy Economic Advisor at the U.S. Pacific Command. Prior to the recall, Major Byrd was the Controller for Law and Economics Consulting Group (LECG) in the San Francisco Bay Area. Her 16 years of civilian professional experience included a wide range of auditing, accounting, and finance positions with well established firms—Ernst & Young, Gillette, GTE, and a start-up company, Wyzdom.com. Major Byrd received her BA in Economics and Accounting from Claremont McKenna College and holds an MBA with emphasis in Asia-Pacific Business and Economics from University of Hawaii.



As an Army Reserves Civil Affairs officer, Major Byrd had conducted and participated in various Humanitarian Assistance and Civic Action projects throughout Southeast Asia. She has developed and coordinated civil-military operation plans for the U.S. Pacific Command's effort towards the War on Terrorism.

As the Deputy Economic Advisor, Major Byrd provides economic perspectives, expertise and analyses to U.S. Pacific Command's Joint Interagency Coordination Group for Combating Terrorism (JIACG/CT). She has also served as a linguist and cultural advisor to U.S. delegations attending ASEAN Regional Forum and POW/MIA recovery negotiations in Burma.

ASIA-PACIFIC ECONOMIC UPDATE 2005

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The views, opinions, and findings contained in this publication should not be construed as an official U.S. Pacific Command position, policy, or decision unless so designated by other official documents.

S U M M A R Y

• V O L U M E I I I •

The Volume III of Asia Pacific Economic Update 2005 addresses transnational issues and concerns facing the region as a whole. Due to the varying expertise required to analyze the region's economic issues, this volume is a collection of papers and collaboration among the following agencies: U.S. Pacific Command's Economic Advisor Office, Asia-Pacific Center of Security Studies, U.S. Army War College, and the Central Intelligence Agency. Various authors who specialize in each subject matter from these agencies contributed to different chapters in Volume III. This volume covers the historical perspective of the region's dynamic economic growth and the significance of the region's role to the global economy and to the U.S.'s national interests. The chapters on terrorism and maritime security provide an analysis of security, threats, and challenges the region and the U.S. are encountering today, and how the U.S. can help address some of these issues. The chapters on food, water, and energy specifically explain the strategic importance of these elements for regional stability and growth.

THE GLOBAL ECONOMIC ROLE OF THE ASIA-PACIFIC REGION

• CHAPTER 1 •

Mark Harstad, Asia-Pacific Center for Security Studies

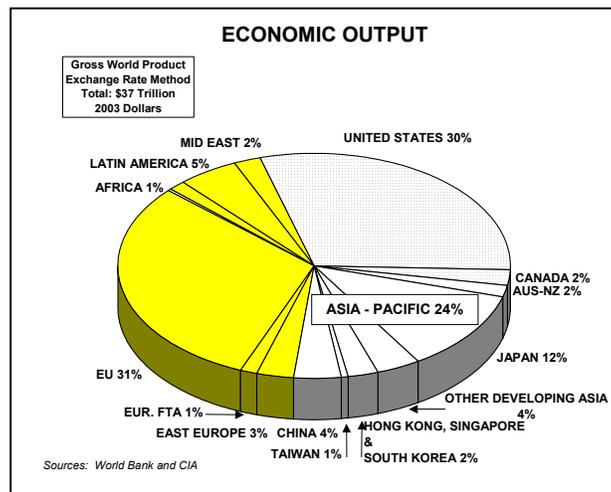
In the aftermath of the Vietnam War, many countries of the Asia-Pacific region focused their attention on producing goods to satisfy the economic demand of the United States and Japan. This resourcefulness resulted in some of the fastest economic growth rates that the world has seen. Much of this prodigious growth was due to a reliance on market economics and a security umbrella maintained by the United States. This chapter looks back at Asia's historical dynamism in order to understand the region's current global economic role.

HISTORIC ASIAN DYNAMISM

Comparisons.

In 1973, Asia accounted for just 15% of the world's economic output.¹ By 2003, the Asia-Pacific region's share was 23.9% of world output when measured on an exchange rate basis. (See Figure 1-A.) Using exchange rates, the world's second largest economy is Japan (14.7% of total), while China (3.4%) is sixth-largest.

Figure A



The exchange rate method measures an entire economy based only on international trade and finance sectors. An alternate method known as Purchasing Power Parity (PPP) makes technical adjustments to give weight to non-international, non-industrial markets.² When using the PPP measure, the Asia-Pacific region far exceeds U.S. and EU totals, producing 35.1% of world output. (See Figure 1-B.) Further, by the PPP measure China is the world's second largest economy (12.4% of total), followed by Japan (6.9%).

Figure B
Comparison of Regional Output (2003)

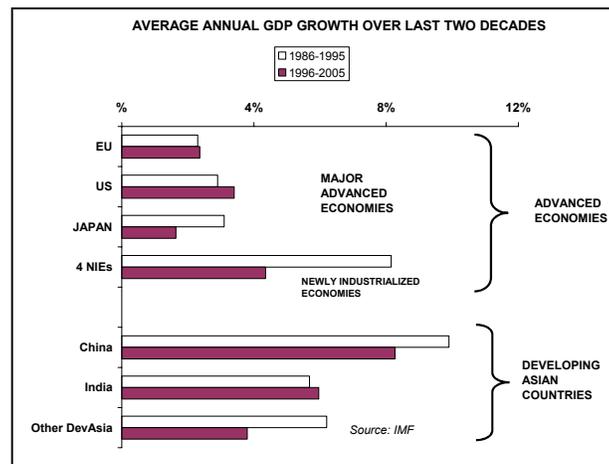
	PPP	Exchange rate
Asia-Pacific	\$17.9T (35.1%)	\$8.8T (23.9%)
United States	\$10.6T (20.8%)	\$11.0T (29.8%)
EU	\$10.9T (21.4%)	\$11.3T (30.5%)
World	\$51.1 T	\$37.0T

Sources: World Bank and CIA

Growth.

Despite growth fluctuations, Developing Asia has had a higher average economic growth than the industrialized United States, Japan, and the EU over the last two decades.³ (See Figure 1-C.) The status of the four Newly Industrialized Economies (NIEs) of South Korea, Taiwan, Hong Kong, and Singapore has transitioned from “developing” to “advanced,” and they now see slower growth as their economies take on characteristics of industrialized economies. Among the developing economies, China has sustained the world’s fastest growing economy over the last two decades, while India also has progressed at a respectable rate despite its high population and incidence of poverty.

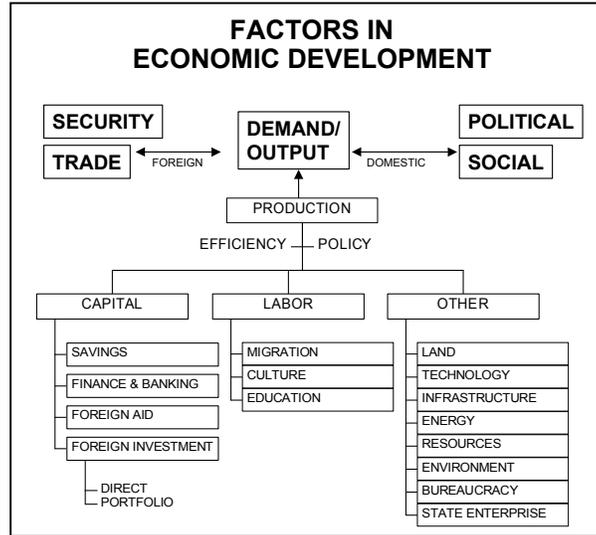
See Figure C



FUNDAMENTAL GROWTH FACTORS

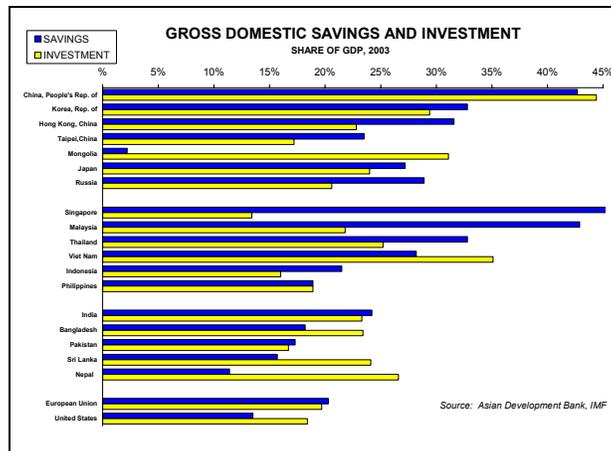
The region’s growth reflects a harnessing of inputs towards internationally-oriented outputs. Long-term growth is sustained by prudent attention to economic policies. When growth falters, the mismanagement of these factors is clearly identifiable, such as when a bubble in property values is created.

Figure D



- Focus on international sectors. Relatively open economies are characterized by vigorous trade and investment ties with the United States, Japan, and Europe. Governments let the private sector meet international demand for consumer goods and technology.
- Harnessing of inputs. High inflows of capital and labor to modern sectors are sought. Societies encourage high rates of national saving and aggressive investment in physical and human capital. (See Figure 1-E.) Foreign capital is obtained in the form of direct investments in factories. Cultures value education and a strong work ethic. Energy is conserved. Productive infrastructure is encouraged. Land values are moderate.
- Prudent policies. The sound rule of law is maintained that encourages trade and investment through strong property rights. Macroeconomic stability is maintained through attention to trade deficits, current account balances, and sound financial market infrastructures. Investment and commercial activity are promoted.
- Peaceful security umbrella. The forward presence of American forces helps dissuade the spillover of petty rivalries into larger regional conflicts and also allows countries to divert resources to economic growth rather than defense spending.

Figure E



Production plus Consumption.

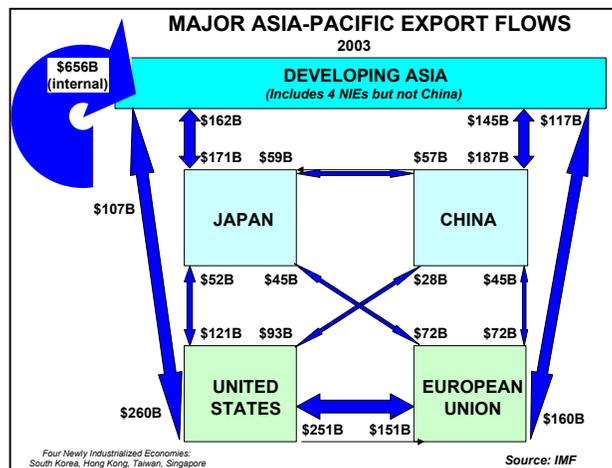
Huge demand from industrialized countries has been a key engine of growth for Asian exports.

- Asia's historic economic policies have promoted domestic investment—rather than consumption—by harnessing domestic savings and investment, profits from exports, and foreign investment.
- Japan's past industrial policy followed this producer-oriented model, which promotes domestic, value-added industries sustained by cheap, intermediate inputs from other Asian producers.
- Over the decade, the countries of the Asia-Pacific have been emerging as lucrative consumer-oriented markets. This trend towards consumption is due to a growing middle-class base of well-paid workers.
- The dilemma of growth is that increased labor income from exports reduces labor's competitiveness with larger and poorer neighbors such as India and China. The dilemma's solution requires sustained growth spirals and prudent micro-, macro-, and institutional economic measures.

MULTIPOLAR TRADE SYSTEM

Asia-Pacific trade is multipolar, with neither the United States nor Japan nor China being the single, dominant trade partner of Developing Asia.⁴ (See Figure 1-F.) The United States produced 10% of the world's \$7.7T of exports in 2003, China 8%, Japan 7%, and the rest of Developing Asia 14%. Thus, Developing Asia represents a significant force in the global trading system.

Figure F



In the early 1990s, exports to industrial countries steered the region's domestic economies at a healthy pace. This openness to foreign markets inspired foreign capital flows to the region in the form of direct investments and, in mid-decade, portfolio investments. However, the macroeconomic policies of many countries left overexposed current accounts and currency rates, while their microeconomic policies were unsupported by sound financial institutions. In 1997, global investors began to withdraw portfolio capital, leading to a chain-reaction of financial crisis across the region. Fortunately, foreign trade remained stable with industrial countries, and an unsteady recovery has ensued. Recent trends include:

- Countries seek positive trade balances in order to accumulate foreign reserves that will buffer their currency markets.

- China's exports are outcompeting regional sectors such as textiles. Meanwhile, China's imports are stimulating region trade in resources.

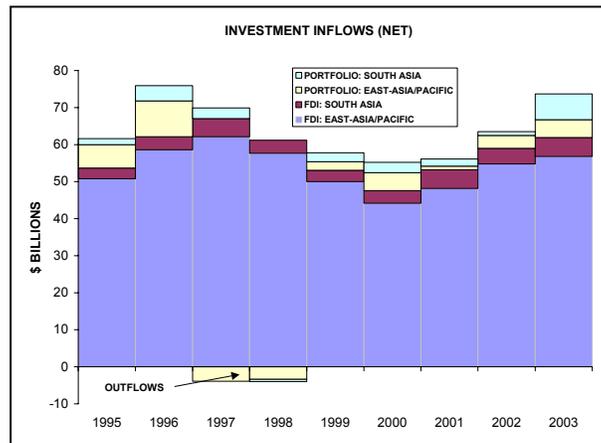
FOREIGN CAPITAL FLOWS IN ASIA

Portfolio investments (i.e., foreign purchases of stocks and bonds) typically have a shorter term than foreign direct investment, which represent a foreign company's long-term commitment to an economy while providing direct control over the management of the investment. Throughout the Asian economic crisis, direct investors sustained a rather confident inflow to the region. U.S. companies in particular have an interest in a prosperous Asia, since U.S. direct investments typically have been used to multiply their access to Asian import markets.

Foreign Direct Investment (FDI).

Developing Asia is the major destination of world FDI into developing countries.⁵ (See Figure 1-G.) It received 45% (or \$62B) of all such flows in 2003—with the majority going to China (\$54B).

Figure G



Source: World Bank

Japan's direct investment position in Developing Asia (including the 4 NIEs) was \$59B in 2003, while U.S. holdings were a significantly higher \$293B.⁶

Portfolio Investment.

In 1997 and 1998 there was a net portfolio outflow from the region. Investors now prefer the region, which, since 2000, annually receives over 60% of portfolio flows to developing countries.⁷ However, net inflows to individual countries—especially China—vary each year according to investor sentiment.

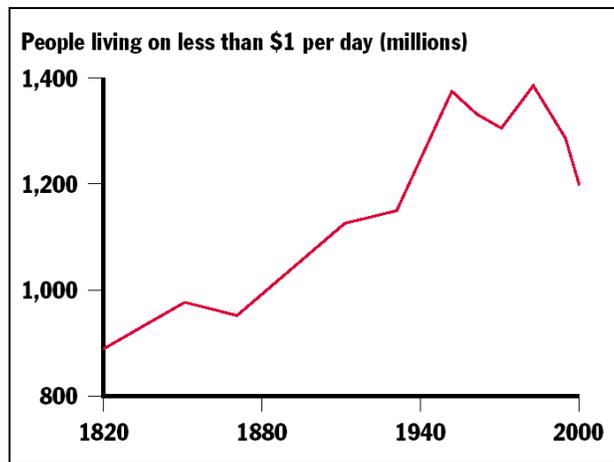
GLOBALIZATION, GROWTH, AND POVERTY

Participation in a global system of trade and better business practices helps increase average income and reduce poverty among the poorest segments.⁸

- Global poverty has declined in the last two decades despite increased populations. The number of people living on less than \$1 a day has declined from 1.4B to 1.2B. (See Figure 1-H.)

- The income of the world’s poor has risen dramatically, and the level of absolute poverty has dropped sharply, from 75% of the population in 1988 to 37% in 1998. Poverty was cut in half in only 10 years.⁹
- The per capita incomes of populous Asia-Pacific countries like China, India, and Bangladesh are much higher than two decades ago. These countries experienced initial growth through privatization, followed by attention towards foreign markets.
- Those who do not employ globalization practices, such as North Korea and Burma, do not see sustained economic growth.
- Research indicates that growth is positively correlated to institutional governance; however, governance is not necessarily correlated to growth, especially in cases of crony capitalism and “state capture” of profitable assets.¹⁰

Figure H
WORLD POVERTY

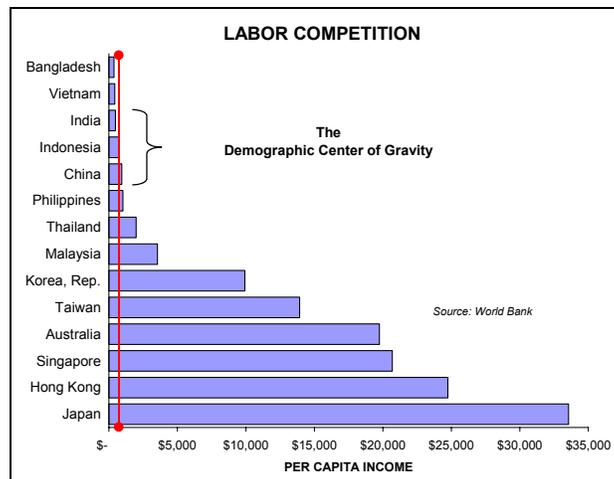


Source: World Bank

Competing Labor Markets.

Populous economies like China, India, and Indonesia are more open and now represent a demographic center-of-gravity that attracts sectors using cheap, unskilled labor. (See Figure 1-I.)

Figure I



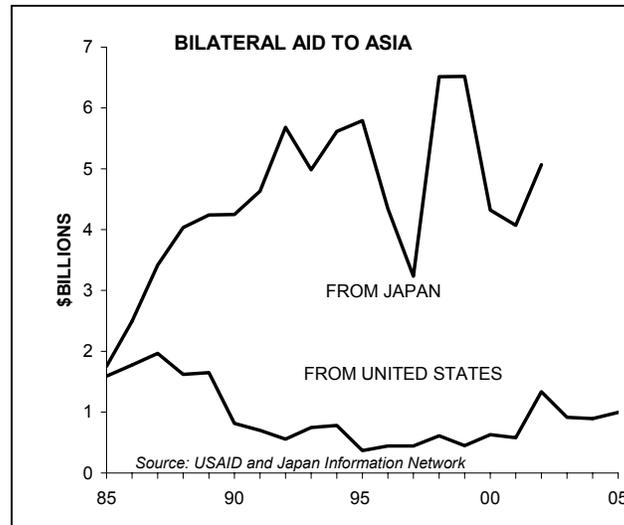
Source: World Bank

Foreign Aid and Other Official Flows.

Many official projects are developed when private flows are risky and not immediately profitable, or where social benefits are key.

- The leading Asian recipients were Viet Nam (\$1.8B), Indonesia (\$1.7B), Bangladesh (\$1.4B), China (\$1.3B), Pakistan (\$1.1B), India (\$0.9B), Philippines (\$0.7B), and Sri Lanka (\$0.7B).¹¹
- While 55% of Japan's aid goes to the region, only 4% of direct U.S. aid does so.

Figure J



KEY FACTORS FOR ASIA'S FUTURE

Energy, Infrastructure, and Environment.

As Asia's economies grow, so do their requirements for a better infrastructure that balances demand in energy, population, and environmental factors. The American experience in achieving this tradeoff gives its businesses a competitive edge in contributing to the modernization of Asia's infrastructure.

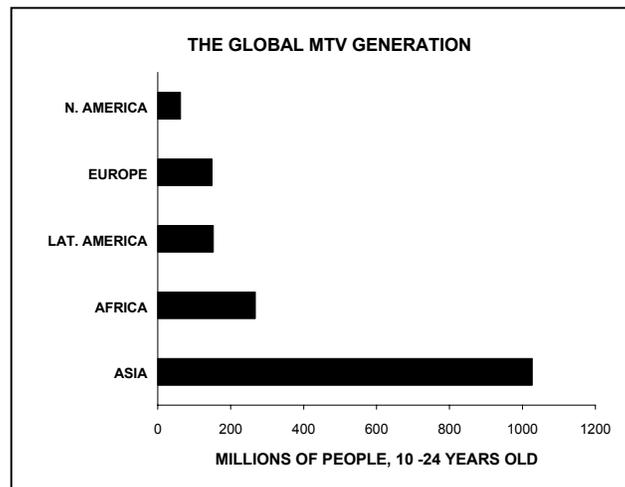
Urbanization.

Urban issues have taken on increasing importance as populations move to the cities, placing stress on physical and social infrastructures. At present, 33% of Developing Asia's population reside in urban areas.

Asia's Demographic Potential.

The magnitude and youth of Asia's population present a huge market for trade and investment in Asia. The Asia-Pacific region's 3.4B people comprise 56% of the world's population. About 1B of Asia's people are between 10 and 24 years old. This "MTV Generation" has been characterized as urban, educated and consumption-oriented—with a reluctance to save. (See Figure 1-K.)

Figure K



Source: World Resources Institute

International Cooperation.

Multilateral trade groups not only promote tariff reduction, but seek a free, fair, and rule-based environment, where healthy competition improves security.

- The World Trade Organization (WTO). WTO membership entails the restructuring of protected sectors. Transitory labor problems ensue, but in the long run there is a decline in producer costs and consumer prices. WTO's dispute mechanisms help to systematize trade dialog. China and Taiwan became members in November 2001.
- Asia-Pacific Economic Cooperation (APEC). APEC is an organization of 21 economies on both sides of the Pacific whose key goal is sustaining growth through economic openness. APEC maintains high visibility through annual Ministers Meetings and concomitant APEC Leaders Meetings.
- Emergent Organizations. Both the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) are planning to reduce tariffs through Free Trading Agreements (FTAs).

ENDNOTES

- ¹ Maddison, Angus, *The World Economy in the Twentieth Century*, 1989 and *Monitoring the World Economy 1820-1992, 1995*.
- ² World Bank, *World Development Report and World Development Indicators* (www.worldbank.org); and CIA, *The World Factbook*. The exchange rate method converts foreign currency to U.S. dollars using market exchange rates. It is fairly straightforward to calculate; however, it does not account for the buying power of a country's currency for those goods and services that are not transacted in the international trading system, but only trade in domestic markets. The PPP method of estimation is more cumbersome, but accounts for domestic purchasing vitality.
- ³ International Monetary Fund (IMF), *World Economic Outlook* (www.imf.org/). In 1997 the Newly Industrialized Economies were given "Advanced Economy" status. See also ADB, *Asian Development Outlook* (www.adb.org).
- ⁴ IMF, *Direction of Trade Statistics*.
- ⁵ World Bank, *Global Development Finance*, (www.worldbank.org/prospects/).

- ⁶ Japan Ministry of Finance, *Regional Direct Investment Position* (www.boj.or.jp/en/stat/bop/data/rdip03.zip); U.S. Bureau of the Census, *U.S. Direct Investment Position Abroad* (www.bea.gov/bea/di/usdctry/longctry.xls).
- ⁷ World Bank's *Global Development Finance* does not include Taiwan, Hong Kong, and Singapore.
- ⁸ Dollar, David and Aart Kraay, "Trade, Growth, and Poverty," *The Economic Journal*, February 2004.
- ⁹ World Bank, *Globalization, Growth, and Poverty*, 2002.
- ¹⁰ Kaufmann, Daniel and Aart Kraay, *Growth without Governance*, 2002 (www.worldbank.org/wbi/governance/pdf/growthgov.pdf).
- ¹¹ OECD, *Development Co-operation* , (<http://www.oecd.org/dataoecd/52/12/1893167.xls>).

THE U.S. ECONOMIC STAKE IN ASIA

• CHAPTER 2 •

Mark Harstad, Asia-Pacific Center for Security Studies

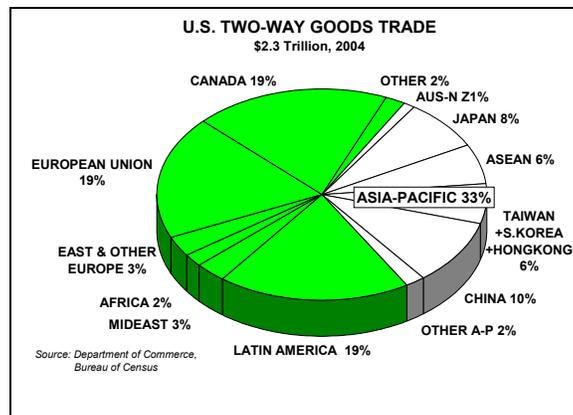
America benefits not only from order and stability in the Asia-Pacific region, but also from our deepening economic inter-dependence. The mutual gain from competition and cooperation has grown to become a vital American security interest. Managing this interdependence, with its attendant benefits and problems, requires enhanced economic cooperation and increased attention to diplomatic and military security relations. As a result of Asia's demographic potential, U.S. producers will increasingly turn to Asia's markets and will capitalize on U.S. strengths in technology, agriculture, consumer goods, and media—critical to improving U.S. trade balances—and also on services such as telecommunications, banking, environmental cleanup, and tourism. Beyond trade, U.S. investors are discovering Asia's markets can be profitable, given sound market institutions.

TRADE AND THE U.S. ECONOMY

International trade has become an increasingly important component of the American economy, as reflected in the rising share of exports and imports in the U.S. economy.¹ U.S. consumption of foreign imports rose from 8% of GDP in 1975 to 13% in 2004. However, U.S. production of exports weakened from 8% to 7% over the same period. The small size of these trade ratios compared to those of other countries reflects the sheer size of the U.S. economy. It also explains the low priority that American institutions—such as its schools and language programs—often give to improving their international foundations.

Developing Asia and Japan are key sources of U.S. imports and major markets for U.S. exports. Although most public attention focuses on America's persistent trade deficits with the region, trans-Pacific trade ties remain, on balance, mutually beneficial. The Asia-Pacific region accounted for an estimated \$767B—or 33.5%—of total U.S merchandise exports and imports in 2004.² (See Figure 2-A.)

Figure A: U.S. Two-way Goods Trade



American companies and their workers both benefit from ties to the global economy. According to Commerce Department calculations, \$1B of exports correlate to between 14K to 19K jobs,³ indicating that more than three million jobs are generated by U.S. exports to Asia. Wages in export industries are about 16% higher than those firms concentrating on domestic sales.⁴

These linkages dictate a major stake in preserving an open trading system on both sides of the Pacific. With interdependencies due to trade and investment, international security frictions increasingly will be greased by economic lubricants. Trade sectors will promote peaceful methods within their own countries, and will challenge their governments to avoid heavy-handed shows of force that threaten profits. U.S. exports and imports are part of a broader security strategy that promotes the peaceful exchange of goods for the profit of all participants. That is, trade is a win-win strategy.

American business has yet to reach its full potential in the region. The attainment of mutual prosperity is impeded not only by foreign official tariffs, but also by other foreign barriers in the form of non-transparent or incomplete legal and regulatory frameworks, insufficient protection of intellectual property rights, bungled industry standards, and official corruption.

U.S. Exports.

The Asia-Pacific region purchased 28%—or \$226B—of U.S. merchandise exports during 2004 (see Figure 2-B).⁵ Japan is America's third-largest export market (\$54B), after Canada (\$190B) and Mexico (\$111B). Developing Asia bought \$156B in U.S. exports, a sizeable 15% increase over 2003. Major American merchandise exports include agricultural products, power industry equipment, computers and electronics, and aircraft and parts. Trade in services—which includes such industries as finance, engineering, and transportation—is not reflected in the merchandise trade data, and represents another opportunity for American firms. Some \$99B in 2003 or 32% of total services exports are with the Asia Pacific region.⁶

U.S. Imports.

In 2004, American consumers bought \$540B worth of goods from the Asia-Pacific market, a full 37% of total U.S. merchandise imports. (See Figure 2-C.) The leading source of U.S imports is Canada (\$256B), followed by China (\$197B), Mexico (\$156B) and Japan (\$130B). Developing Asia (less China) as a whole sold \$204B. While a significant share of U.S. imports represent low-end, labor-intensive production (such as toys and textiles), imports from Developing Asia now include electronics and machinery. The diversity of low-end and high-tech products sold by the region reflects its progress up the development ladder.

The U.S. Trade Deficit.

The region alone accounted for 48% of the \$652B U.S. merchandise trade deficit in 2004. (See Figure 2-D.) China now comprises 25% of the deficit and Japan 12%. Trade deficits are influenced more by macroeconomic policy than disputes over trade barriers. Such policy seeks to balance savings and investment, taxes and government spending, and foreign transactions of goods, services, and finance.⁷ Balances reflect not only government policies and market conditions but also domestic politics, management practices, and cultural dispositions toward savings and consumption.

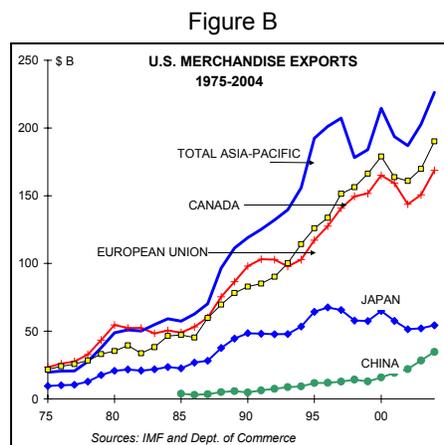


Figure C

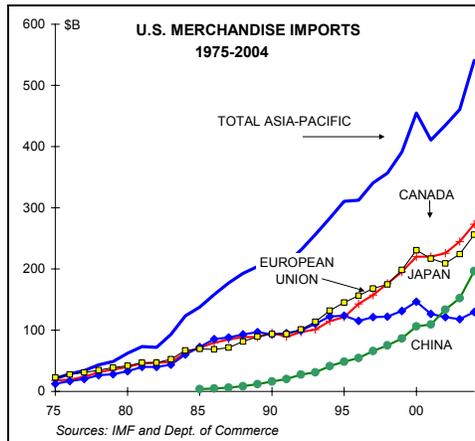
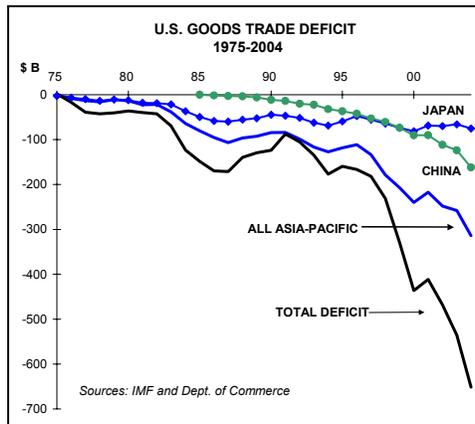


Figure D



U.S. INVESTMENT ABROAD

U.S. Direct Investment Abroad (DIA).*

Typically U.S. companies use their direct investments in Asia to augment the market for U.S. export sales. U.S. holdings in the Asia-Pacific region increased substantially from \$46B in 1987 to \$293B in 2003⁸ and occurs primarily in the industrialized Asian economies of Japan, Australia, the Four NIEs, and China. (See Figure 2-E.) American companies in Asia have yet to realize their full potential, since 33% of U.S. merchandise trade is with Asia, but only 16% of its DIA is in the region. This trade-investment mismatch is partly due to misgivings of U.S. investors in Asia-Pacific economic institutions, with investors concerned over internal stability more than traders.

* Direct investment occurs when an investor owns more than 10% of the targeted business.

U.S. Investment in Foreign Securities.**

In the mid-1990s, an overconfident inflow of portfolio investments to the region induced a withdrawal reaction among investors who belatedly learned, for example, that investments in Asia were directed to unproductive and inflated property markets. Not only were financial institutions weak in the region, but also basic business laws concerning bankruptcy were not instituted. Today, U.S. purchases of foreign securities is cautiously returning. (See Figure 2-F.)

Multinationals and Labor Outsourcing.

Statistical surveys⁹ indicate that the typical U.S. activity of outsourcing to foreign affiliates promotes sales and employment on both sides of the production chain. Outsourcing is a microeconomic activity that serves to adjust the absolute and comparative advantages of production for both parent and affiliate.¹⁰

Foreign Aid as Investment.

Foreign aid is an order of magnitude smaller than private flows; however, it provides policy makers an opportunity to directly shape development. Such aid can be effective for large infrastructure projects, where market forces are difficult to mobilize. Top U.S. aid recipients are Egypt (\$535M in 2005), Afghanistan

Figure E

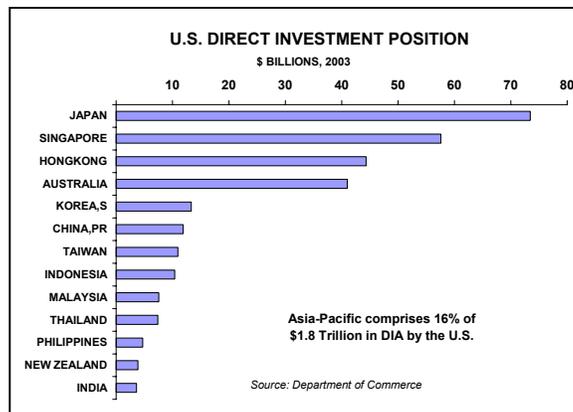
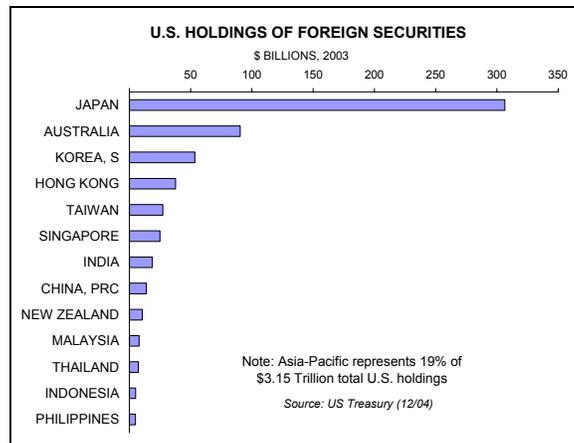
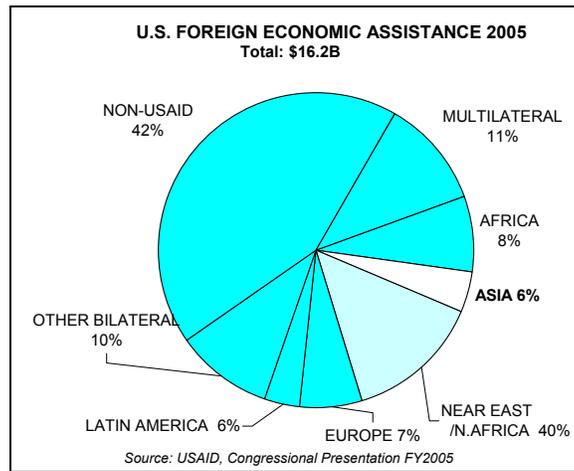


Figure F



** Securities investments include those in corporate stocks and bonds, government agency bonds, and treasury bonds and notes.

Figure G



(\$397M), Israel (\$360M), Pakistan (\$350M) and Jordan (\$250M). The Asia-Pacific region directly received \$646M, or 6% of U.S. economic assistance in 2005.¹¹ (See Figure 2-G.) American military assistance to the region is modest, going towards International Military Education and Training (IMET, \$9.5M) and Foreign Military Finance (FMF, \$32M) grants.

FOREIGN CAPITAL INVESTMENT IN THE UNITED STATES

Foreign Direct Investment (FDI).

Japan's sizeable FDI in the United States (\$159B in 2003) is driven at the macro-economic level by the availability of dollars caused by the imbalance of bilateral trade and at the micro-economic level by the desire of Japanese companies to reduce risks by establishing in-country manufacturing ties with U.S. markets. Emerging markets in Asia use FDI in U.S. markets to promote access and distribution networks. Nevertheless, the primary source of U.S. FDI remains Europe, due to the greater integration of multinational corporations across the Atlantic.

Foreign Investment in U.S. Securities.

A striking trend of several Asian countries is to defend their currencies, their current account surpluses, and their trade flows by investing in U.S. securities. Following the lead established by Japan in the late 1980s, the Four NIEs, China, and Australia are increasing their claims on U.S. financial assets. (See Figures 2-I and 2-J.) Securities represent to these countries a reserve of stable U.S. assets that can also be used as a tool to defend their currencies against market raids. In general, the inflow of foreign securities investment lowers U.S. interest rates and provides alternate sources of capital to U.S. firms.

Figure H

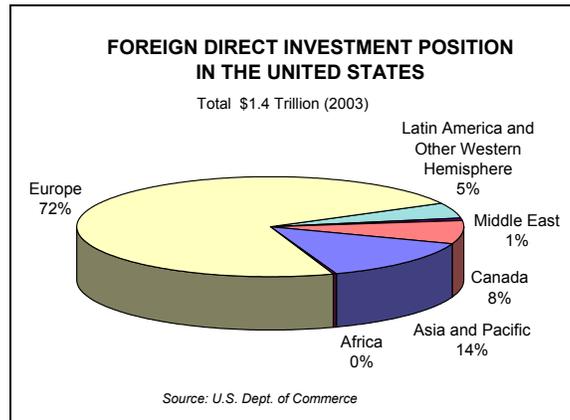


Figure I

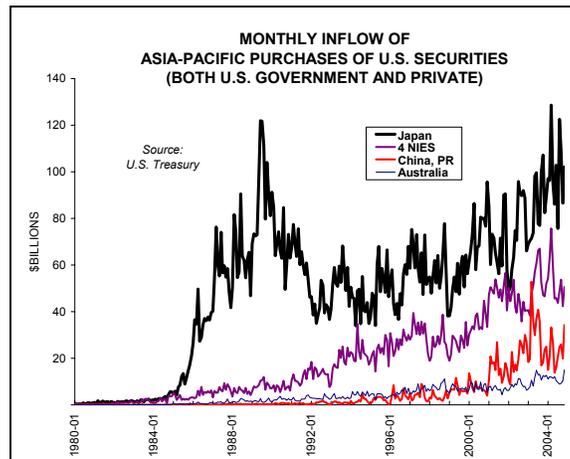
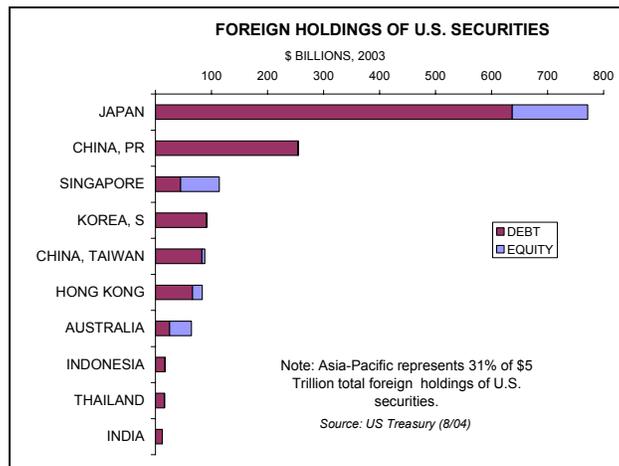


Figure J



ENDNOTES

- ¹ Department of Commerce, Bureau of Economic Analysis, *National Income and Product Accounts* (www.bea.doc.gov/bea/dn/nipaweb/). Includes goods and services trade, and is based on a recent revision of the National Income and Product Accounts.
- ² Department of Commerce, Bureau of the Census, *FT-900 Supplement*, (www.census.gov/foreign-trade/) February 2001. Census import figures do not include freight and insurance.
- ³ U.S. Trade Promotion Coordinating Committee, *National Export Strategy*, October 1995 and October 1996. Job ratio estimates are of limited use when applied to an economy in equilibrium.
- ⁴ U.S. Trade Promotion Coordinating Committee, *National Export Strategy 2004*, April 2004 (www.ita.doc.gov/media/Publications/pdf/nes2004.pdf).
- ⁵ Department of Commerce, Bureau of the Census, (www.census.gov/foreign-trade/) February 2004.
- ⁶ Department of Commerce, Bureau of Economic Analysis, "U.S. International Transactions Accounts," (www.bea.doc.gov/bea/international/bp_web) . "Other Asia" also includes a minor amount to Africa.
- ⁷ Economic Report of the President together with the Annual Report of the Council of Economic Advisors, February 2004 (www.gpoaccess.gov/eop/index.html).
- ⁸ Department of Commerce, Bureau of Economic Analysis, "International Economic Accounts," (www.bea.doc.gov/bea/di1.htm).
- ⁹ Matthew J. Slaughter, "Globalization and Employment by U.S. Multinationals," March 2004 (<http://mba.tuck.dartmouth.edu/pages/faculty/matthew.slaughter/MNEOutsourcing200304.pdf>)
- ¹⁰ Economic Report of the President together with the Annual Report of the Council of Economic Advisors, February 2005 (www.gpoaccess.gov/eop/index.html).
- ¹¹ Agency for International Development (U.S.AID), Congressional Presentation, Summary Tables, FY 2005. http://www.usaid.gov/policy/budget/cbj2005/pdf/fy2005summtabs4_alloc.pdf Note: In contrast to OECD foreign aid figures, U.S. government statistics also include military and other forms of assistance.

A SOCIO-ECONOMIC STRATEGY AGAINST VIOLENT EXTREMISM

• CHAPTER 3 •

Dr. Leif Rosenberger, U.S. Pacific Command

Introduction.

The tragic events of 9/11 caused the United States to reprioritize its strategic interests in the world. Almost overnight the war on terrorism jumped to the top of the list. The 9/11 attacks were a wake-up call to defend the U.S. homeland. Beyond the homeland, the main front for this war on terrorism quickly became Southwest Asia. The United States attacked Al Qaeda and the Taliban in Afghanistan.

Prior to 9/11 the most important U.S. strategic interest in SE Asia was arguably America's shared prosperity with ASEAN states.¹ But since 9/11, U.S. leaders began to see the region in a different light. Admiral Thomas Fargo, the PACOM Commander, refers to Southeast Asia as a "primary fault line" in the war on terrorism. Other observers in the U.S. see SE Asia as a "second front" in the war on terrorism. If so, what is the nature of this second front? In particular, what is the military dimension? The metaphor of a war against terrorism accurately describes the effort to capture or kill terrorists in Afghanistan. The language of war also helps to evoke a national mobilization. But the conflict in Afghanistan gives the false impression that the war against terrorism is a conventional war. In fact, Afghanistan was an exception.

What makes this terrorist threat so difficult to tackle is its multi-dimensional nature. After Afghanistan, the scope for conventional military action in places like SE Asia is quite limited. Admittedly, the military does play a role in the U.S. war on terrorism in Southeast Asia. But any success in reducing terrorism in Southeast Asia demands the use of all the elements of national power -- diplomacy, intelligence, law enforcement, economic policy, foreign aid, public diplomacy and homeland defense as well as military power. The U.S. government is well aware of the need for interagency cooperation. But in practice, U.S. interagency operations in the war on terrorism are difficult to implement.

MISSING: STRATEGY

Another crucial gap in American policy is absence of a comprehensive long-term strategy to counter terrorism, according to the bipartisan 9/11 Commission Report released in June 2004. The report says that what the U.S. needs first and foremost is a grand strategy. In fact, the bulk of the 9/11 recommendations call for a broad political and economic strategy. Of the 27 recommendations in chapter 12 on developing a global strategy, only one can be seen as advocating the use of military force: attacking terrorists and their sanctuaries. And even this one requires multilateral cooperation cited earlier.

Recently, Secretary of Defense Rumsfeld and other top officials from the Bush Administration have changed the way they talk about terrorism to be more consistent with the vision of the 9/11 Commission Report. They have shifted their strategic communication terminology from a narrow "war against terrorism" to "a struggle against violent extremism" (SAVE). The administration is making the change because the war on terrorism focused too much on terrorism as a tactic. In this regard, Philip Zelikow, special assistant to Secretary of State Rice, is leading the effort at the head of a 10-member U.S. committee that is expected to lead to a formal declaration of a new U.S. national strategy. How do we go from new semantics to a new strategy?

CRAFTING A STRATEGY

Crafting a strategy requires three components: ends, ways and means. The ends or what is wanted (a reduction in terrorism) is straightforward. The means (the financial resources needed) is conceptually straightforward once the ways are established. But what makes strategy formulation difficult is coming up with ways. How do we reduce terrorism? What strategic concepts are needed? The answer to these questions is difficult because they require creative thinking. Creative thinking is prevalent in the U.S.

business sector. But the 9/11 report is critical of U.S. government analysts for their lack of imagination. Former Singapore Prime Minister Goh has criticized the people in Singapore for their rigid mindsets. In fact, he initiated a “remaking Singapore” program to instill more creativity and innovation in the people in Singapore.

Most analysts of violent extremism start with two reasonable assumptions: a) law enforcement plays a central role in combating violent extremism and b) violent extremism must be treated as a crime. If so, how should SE Asian police forces reduce violent extremism? Interestingly enough, three members of the New York City Police Department (NYPD) are currently working with analysts at the Institute for Defense and Strategic Studies (IDSS) in Singapore. What can the NYPD police teach IDSS analysts about countering violent extremism?

Back in the late 1980s the crime rate in New York was among the highest in the country. Then in the 1990s Rudi Giuliani became the mayor. Mayor Giuliani changed the philosophy of policing in New York. Before Giuliani, New York City had reactive policing. A crime would take place. The dispatcher back in headquarters would call a police officer in his car. The police officer would drive to the scene of the crime. The people in the area would flee, always fearful that the police might arrest them if they were nearby. Police officers would be rewarded based on their number of arrests and convictions.

PROTECTING THE PEOPLE

Giuliani changed all this. He took police officers out of their cars. He sharply increased the number of cops on the beat. By walking the beat, NYPD police bonded with the people. People in the neighborhood now viewed the police differently. The police were there to protect them from crime. The people would alert the police to any strange developments. That pro-active public awareness and two-way communications helped to prevent crimes from taking place.

As a result, the number of crimes taking place in New York City dramatically fell. It also reduced fear of crime. New York became one of the safest cities in the United States. That boosted confidence and the people reclaimed their parks, playgrounds and streets. People started shopping again in Manhattan. The economy took off. This same creative approach to reducing crime could arguably be used to dramatically reduce violent extremism in places like southern Thailand, the Philippines and Indonesia.

TURNING ENEMIES INTO FRIENDS

In strategy formulation, the U.S. also needs to differentiate between hard-core violent extremists and those individuals who would abandon the cause if given a viable alternative. During the 1980s the U.S. did not have to capture or kill all the communists to “win” the Cold War. Instead President Ronald Reagan persuaded many communists that democracy and the free market were better than communism. The lesson learned in the Cold War ideological struggle is that people can and do change. President Ronald Reagan turned enemies (like Gorbachev) into friends. Similarly, the Chinese communists became capitalists in all but name.

President Bush says the U.S. will not bargain or negotiate with Al Qaeda. The U.S. position is that there is no common ground or basis for dialogue with Al Qaeda. But there is always a danger that the U.S. makes the mistake of coloring a moderate Moslem group that criticize U.S. policy with the same brush that it uses to track down violent Moslem extremists. So the U.S. needs to sort out hard-core terrorists who should be captured and brought to justice from those it seeks to win over.

DEFENDING U.S. IDEALS

The 9/11 Report also argues that the U.S. needs to defend its ideals vigorously, even when U.S. friends or allies do not respect these ideals. Why? Another U.S. Cold War lesson is the following:

“Short term gains from cooperating with the most repressive and brutal governments were too often outweighed by long-term setbacks for America’s stature and interests.”²

A good Cold War case study in this regard occurred in El Salvador. The U.S. kept sending guns to the military in El Salvador to kill FMLN (Farabundo Marti National Liberation) insurgents. Poorly trained right wing “Death Squads” would use these guns to kill innocent victims as well as communist violent extremists. More and more innocent victims joined the FMLN insurgency and the number of violent extremists rose. After awhile a stalemate was reached. The one-dimensional U.S. military approach to countering violent extremism failed. The rigid U.S. mindset finally changed, which in turn led to progress in ending this bloody conflict in which both sides were guilty of terrorism and other atrocities. The U.S. learned that the FMLN insurgents had some just grievances. The U.S. changed its role from military sponsor to that of an honest broker with the UN. Right Wing Death Squads and FMLN insurgents were brought together in the same room.

The ability to forgive and forget didn’t happen overnight. But step-by-step the combatants gradually but steadily moved toward reconciliation. At first, there was anger and demands for revenge. Then came a full accounting of the truth about atrocities on both sides. Next came the punishment phase. Only after there was a sense of justice was it possible for the anger and demands for revenge to start to fade. The society then moved towards opportunity and hope. The final phase is reconciliation, as in Cambodia today.

TOWARD A COALITION STRATEGY

Next the U.S. strategy must be transformed into a coalition strategy.³ The U.S. cannot fight violent extremism alone. Practically every aspect of U.S. efforts against violent extremism activities in SE Asia relies on international cooperation.⁴ Without close multilateral cooperation, there are simply too many nooks and crannies for violent extremists to exploit.

But a coalition doesn’t mean everyone has to “jump onboard” and do it the American way. Open policy debate on counter-terrorism should be fostered, not discouraged. The policy debate among U.S. friends and allies does not undermine U.S. ideals. It enhances them. One of the most important U.S. freedoms is freedom of speech. The 9/11 Report lauds respect for the rule of law, openness in discussing differences and tolerance for opposing points of view.⁵ In this regard, the U.S. Senate Intelligence Committee reviewed CIA’s pre-war intelligence failure on both WMD and Iraqi operational support for Al Qaeda. The committee blamed groupthink for creating false threats.⁶

POLICY DIFFERENCES

Thankfully, groupthink was not a problem at the Shangri-La Dialogue of Defense Ministers in Singapore in June of 2004. Some Asian leaders at the Shangri-La meetings said that the U.S. was tackling the war on terrorism in the wrong way, radicalizing Asia’s Moslems and failing to appreciate the growing domestic opposition to the U.S. policies that are weighing on Asian allies.⁷ A few days earlier Malaysia’s new Prime Minister Abdullah Badawi – a former moderate Islamic teacher -- blamed the Israeli-Palestinian problem and U.S. policies in Iraq for radicalizing even more people, breeding a new generation of violent extremists, refusing to recognize some root causes of terrorism and consciously and deliberately aggravating the problem.⁸ Abdullah speaks from experience. He successfully used a subtle approach to defeat PAS in two states by addressing grievances (such as corruption in the ruling UMNO) and not inflaming passions. Armed

terrorists were captured without deaths on either side. In so doing, Abdullah avoided the pitfalls of the right wing death squads in El Salvador who kept creating new violent extremists.

POLICY CONSEQUENCES

The 9/11 Report says that America's policy choices have consequences.⁹

"Rightly or wrongly, it is simply a fact that American policy regarding the Israeli-Palestinian conflict and the war in Iraq are dominant staples of popular commentary across the Arab and Moslem world."

Former Singapore Prime Minister Goh concurs and says that increasing numbers of moderate Muslims around the world are uncomfortable with America's Middle East policies and therefore can't justify joining the wider fight against terrorism. Like Malaysian Prime Minister Abdullah, Goh argues that a more balanced and nuanced U.S. approach towards the Israeli-Palestinian conflict must become a central pillar of the global war on terrorism.¹⁰

RESENTMENT

Notwithstanding the critique of ASEAN states, the United States is heavily engaged in the Middle East and the broader Moslem world and will be for years to come. The 9/11 Report persuasively argues that this U.S. engagement is resented.¹¹

- Polls in 2002 found that among America's friends, like Egypt – the recipient of more U.S. aid for the past 20 years than any other Moslem country – only 15% of the population had a favorable view of the United States.
- In Saudi Arabia the number was 12%. And two thirds of those surveyed in 2003 in countries from Indonesia to Turkey (a NATO ally) were very or somewhat fearful that the United States may attack them."¹²

Since the U.S. invasion of Iraq, support for the United States has plummeted even outside the Mid-east. Polls taken in Islamic countries after 9/11 suggested that many or most people thought the United States was doing the right thing in its fight against terrorism. Few people saw popular support for Al Qaeda. Half of those surveyed said that ordinary people had a favorable view of the United States. By 2003, polls showed that the bottom has fallen out of support for America in most of the Moslem world. Negative views of the U.S. among Moslems, which had been largely limited to countries in the Middle East, have spread.

- Since the summer of 2003 favorable ratings for the U.S. have fallen from 61% to 15% in Indonesia and from 71% to 38% among Moslems in Nigeria.¹³

Which groups should the United States target in trying to win hearts and minds? For starters, the small number of Moslems who are fully committed to Usama Bin Laden's version of Islam are currently impervious to persuasion. But the United States could attract the large majority of Arabs with what Harvard's Joseph Nye calls a soft power message that encourages reform, freedom, democracy and opportunity. That said, as long as Americans are the carriers of this message, these messages are of limited effectiveness. The 9/11 Report persuasively argues that the United States can promote moderation but cannot ensure its ascendancy. Only Moslems can do this.

TOWARD OPPORTUNITY AND HOPE

How can the United States be more effective in reducing anti-Americanism? Perhaps U.S. Deputy Secretary of State Richard Armitage puts it best: "Americans have been exporting our fears and our anger, not our vision of opportunity and hope."¹⁴ The United States and its ASEAN partners need to foster economic opportunity and hope for a better life if the war on terrorism is to achieve anything but tactical successes.¹⁵

Educational opportunity is also essential to winning the struggle against violent extremism. The United Nations correctly equates literacy to freedom to develop one's potential. Education also teaches tolerance, the dignity and value of each individual, and respect for different beliefs as a key element in any global strategy to eliminate Islamist violent extremism.¹⁶ President Bush talks about his education program, "No Child Left Behind" in the U.S. This same philosophy should be spread globally to help reduce the root causes of terrorism.

BREEDING GROUND

Some people are quick to make the case that poverty and illiteracy do not cause violent extremism. They also say that lots of terrorists come from relatively well-off families. In addition, they point to parts of Africa where there is widespread poverty and no violent extremism. True enough. But it doesn't take much radical leadership and organization to exploit poverty and illiteracy, use the United States as an ideological scapegoat and ignite anti-U.S. violent extremism in the Mid-east. After all, 40% of adult Arabs are illiterate. 1/3 of the broader Middle East lives on less than two dollars a day. The same social and economic injustice that fans incendiary conditions for violent extremism in the Mid-east can and does occur in ASEAN states. The 9/11 Report persuasively argues that --

"When people lose hope, when societies break down, when countries fragment, the breeding grounds for violent extremism are created. Backward economic policies and repressive political regimes slip into societies that are without hope, where ambition and passions have no constructive outlet."¹⁷

UNDERCLASS

Meanwhile the Asian underclass is not remaining passive in the face of poverty and illiteracy. Poor people are rising up and venting their frustration. The underclass was a key political driver when the ruling BJP was voted out in India. A similar political event happened in Mongolia. Despite strong economic growth in both places, the incumbent government was voted out. The good news is that this was all done peacefully.

But when there's no peaceful way to vent, the potential for violent extremism to break out increases. Elections come and go but the needs of the underclass are ignored. As a result, violent extremism breaks out in places like Nepal, Indonesia, southern Thailand and parts of the Philippines. Pervasive poverty in Laos and Cambodia also create the potential for violent extremism unless the governments can provide a better way of life for the underclass.

THAILAND'S SOUTHERN INSURGENCY

The outbreak of Islamist violence in Thailand's Moslem south is particularly disturbing since this separatist militancy has not been seen since the 1970s and 1980s. Thai authorities initially played down over 100 killings since January 2004. But they are not dismissing it anymore. Anxious Buddhists are buying guns and training for battle. In one sense the conflict is a religious struggle that pits Moslem insurgents against a

Buddhist dominated government. The militant Moslems want to restore Pattani's independence that was annexed by the Buddhist kingdom of Siam a century ago.

But in another sense the previously dormant conflict has found fresh partisans among those religiously fervent Moslem youth that lack jobs, hope and opportunity. Moslem teachers tell them Buddhists are responsible for hopelessness and their only hope for a better life is a "Jihad for Pattani." Bangkok cannot change this mindset simply by killing Moslems. If Bangkok wants to persuade Moslem youth to rediscover their loyalty to Thailand, Thai authorities need to offer an attractive alternative. Bangkok needs to provide a viable economic development package and new jobs.

CONCLUSION

Creating macroeconomic growth and prosperity for a privileged few is not enough. Prosperity is like a pile of horse manure. It must be spread around as fertilizer before things grow. In this regard, it's important to understand that strong economic growth is not an end in itself. Economic growth is a means to generate employment, banish poverty, hunger, and homelessness and improve the standard of living of all the people. To sum up, spreading prosperity, while not a silver bullet, does help in combating violent extremism. Conversely, poverty and illiteracy are easy prey for violent extremists to exploit.

SUBSEQUENT ECONOMIC UPDATES

02 May 2005

Socio-economic instability is rising in the Muslim world and is challenging U.S. interests.

- Recent trends in social and economic activity in numerous Muslim-majority countries – including Bangladesh, Indonesia and Malaysia -- paint a grim picture and point to significant challenges ahead.
- Socioeconomic woes are creating environments in which discontent is growing and in which activist or radical Islamic messages have increasing resonance.
- Islamic activism often finds strong support among populations buffeted by poor economic conditions and young people whose aspirations for a better life have been thwarted.
- Though not the only factor, socioeconomic frustrations are among the key drivers of alienation and radicalism.

Economic Advisor's Comment:

These adverse trends provide conceptual justification for the following:

- National Strategy for Combating Terrorism Goal # 3 -- Diminish the Underlying Conditions that Terrorists Seek to Exploit;
- 9/11 Report Recommendation # 7 – Provide Hope and Socio-economic Opportunity;
- National Military Strategy Plan for the War on Terrorism (NMSP-WOT) Pillar on Environment Development;

In addition, these trends provide new impetus for the PACOM J5/Joint Interagency Coordination Group for Combating Terrorism (JIACG-CT) and National Intelligence Council (NIC)/CIA co-sponsored Conference at the US Army War College (USAWC) on Addressing Socio-economic Conditions that Foster Terrorism, 8-10 June 2005.

- This PACOM/CIA/USAWC conference discussed the US inter-agency process that is trying to drain the swamp (or reverse these grim socio-economic conditions), identify gaps in the process and recommend creative and decisive new ways to overcome them.

ENDNOTES

¹ For more on these subjects see the following forthcoming publication: Leif Rosenberger, *Asia Pacific Economic Update 2005*, U.S. Pacific Command, Camp Smith, Hawaii, U.S.A.

² The 9/11 Commission Report (henceforth 9/11 Report) Recommendation # 6, p. 376.

³ See 9/11 Report, Recommendation # 10 on p. 379.

⁴ See 9/11 Report, p. 379.

⁵ 9/11 Report, p. 376.

⁶ See U.S. Senate Select Committee on Intelligence, *Report on the U.S. Intelligence Community's Prewar Intelligence Assessments on Iraq*, 2004.

⁷ *Far Eastern Economic Review*, (henceforth FEER), "Same Planet, Different World," 17 June 2004.

⁸ *Ibid.*

⁹ 9/11 Report, p. 376.

¹⁰ FEER, 17 June 2004.

¹¹ See 9/11 Report, pp. 362 and 375.

¹² *Ibid.*

¹³ *Ibid.*

¹⁴ 9/11 Report, p. 377.

¹⁵ See 9/11 Report, Recommendation # 9 on page 379.

¹⁶ *Ibid.*

¹⁷ 9/11 Report, p. 378.

Major Miemie Winn Byrd, U.S. Pacific Command

Threats of terror and terrorist attacks cause significant economic casualty and creates a negative economic environment throughout the region. Therefore the solution to address the terrorism problem must include an economic angle and perspective. The U.S. long-term strategy to combat terrorism in Asia-Pacific Region must consider all elements of economic factors. Assisting the regional governments in developing sound macro economic (both domestic and international) policies are necessary, but not sufficient.

In addition a comprehensive economic strategy must also include means to ignite inclusive, bottom-up, and sustainable micro economic development plans to effectively counter underlying conditions that foster terrorism. Hundreds of known terrorist leaders have been killed and captured since 9/11, but the underlying conditions in the region remain largely unchanged today.¹

Uncontained Terrorism Undermines Trade.²

While economic development and creating new opportunities and jobs are one of the essential elements in containing terrorism, the threat of terrorism undermines economic growth.

- The threat of terrorism reduces trade flows.
- The continuing threat of terrorism raises the cost of trade.
 - Increased insurance costs for cargoes and passengers.
 - Increased inventory-carrying costs due to maintaining higher levels of inventory (just-in-case inventory - reducing benefits gained from just-in-time manufacturing processes).
 - Increased cost in implementing new and additional security measures.
 - Increased inflation as the increased costs are passed onto the consumer.

Threat of Terrorism Reduces Investment and Economic Growth.³

Terrorism and the high possibility of future terrorist attacks create uncertainty, which increases perceived risk. This increase costs through several channels and dampens economic activity.

- Increased perception of risk undermines investor confidence, reducing their willingness to commit to new projects.
- Overtime, higher risk premiums increase required rates of returns on investments. This reduces equity prices and biasing investment decisions against riskier, long-term investments. Many investors will move towards lower risk, lower return and shorter-term investments.
- Higher risk premiums impact mostly on economies with substantial external financing requirements. Now, they must pay more for their capital, lowering investment, and output growth.
- In developing economies, which are perceived, as failing to deal effectively with terrorism will face higher risk premiums and the cost of protecting assets will rise, reducing foreign direct investment (FDI) inflows.
- Investments in major long-term energy and infrastructure projects that require large-scale networks and coordination across several countries are highly sensitive to increased perceptions of security risk.
- Airline, travel, tourism, accommodation, restaurant, postal services, and insurance industries are particularly susceptible to increased terrorism risks. Regions and economies where these industries are concentrated suffer most from fall of output and employment.

- Increased terrorism risks and associated uncertainty also reduce consumers' willingness to spend, particularly on discretionary items and major consumer durables, thereby reducing investment in consumer goods industries and depressing growth.
- Currencies of economies carrying higher risk premiums may experience exchange rate volatility and sudden depreciation in response to terrorist events, as investors switch to reserve currencies such as the U.S. dollar; this could impose significant costs on these economies.
- Currency exchange rate depreciation makes exports more competitive, however it also increases domestic inflation and makes foreign currency debt obligations more expensive. Volatile currency exchange rates can discourage foreign investment and encourage capital flight.
- Cumulative effect – reduced overall investment and retard economic growth.

Threat of Terrorism Hurts Developing Economies in Asia-Pacific.⁴

While costs of uncontained terrorism are significant for all economies, it could impose a disproportionately high cost on developing Asia-Pacific economies' trade and income growth.

- Most developing economies in Asia-Pacific depend heavily on trade flows, particularly with the U.S. and OPEC countries.
- Many regional developing economies rely on receiving strong FDI inflows.
- Insurance companies may impose higher insurance premiums on cargoes and vessels traveling to and from these countries due to uncertainty surrounding the adequacy of local security procedures.
- Currency exchange rate volatility can devastate the whole region's economy. Case in point, the Asian financial crisis in 1997 was initiated by a sudden Thai Bhatt depreciation.

COMBATING TERRORISM

Think of it as an investment rather than cost.⁵

Implementation of new counter terrorism measure requires one-time investments, which will lead to short-to-medium term increases in the costs of doing business.

- These costs should be viewed as an investment that will pay future dividends through reduced risk premiums and increased trade efficiency.
- In addition to the benefits of reducing exposure to terrorism, technological advances to increase security are likely to increase the efficiency of cargo handling and people movement, lowering trade costs and making trade flows more efficient.

The significant benefit for the regional and global economy from preventing losses from reduced trade flows and encouraging investment is a continued economic growth.

Combating Terrorism by Economic Growth.

Economic growth and prosperity enable nations and organizations to fund economic development policies and activities. Economic development policies will contribute to creation of opportunities and thereby expand a new middle class in communities that have traditionally lent support to terrorist groups. In many cases, as this section of the population becomes aware and recognizes the economic benefits of peace, they will work indigenously to inhibit local support for terrorist activities.⁶ The effective economic development policies can be one element to fulfill the 9/11 Commission's recommendations:

- Identifying potential terrorist sanctuaries and prevent them from becoming an operational space for the actors of terror.⁷
- A comprehensive U.S. strategy to counter terrorism should include economic policies that encourage development, more open societies, and opportunities for people to improve the lives of their families and to enhance prospects for their children's future.⁸

Igniting and sustaining economic growth in the regions' poorest and poverty stricken areas require imagination, creativity, and cooperation. The stakeholder nations and organizations in the region should pool its resources and capability together to address this problem. Cooperation among cross discipline organizations such as UNDP, various governmental aid agencies and militaries, NGOs, and private businesses will be vital to solve this problem.

Although economic development can inhibit terrorism, this aspect alone cannot eliminate it. It must be an element of a comprehensive approach, integrating economic development with wider political, informational, military, and social dimensions.

Using the tools of business to diminish the causes of terrorism.

In the words of General Charles F. Wald, Deputy Commander, U.S. European Command,

*"The tools of businesses are often better suited to diminishing the causes of terrorism and influencing the democratization of key regions by providing investment and employment that lead to long-term improvement in quality of life"*⁹

The emerging 'BOP' concept in the business sector.

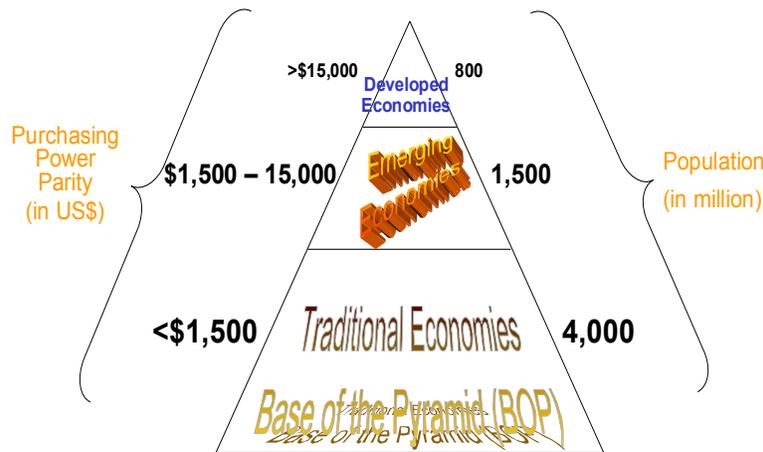
The concept of 'eradicating poverty through profits' involves finding a better approach to alleviate poverty for those at the Bottom of the Economic Pyramid (BOP) through collaboration among the poor, civil society organizations, governments, and large private firms.¹⁰ Therefore, this concept is widely known as the BOP concept. The successfully built markets at the BOP are a sustainable way to improve economic conditions that in turn will create hope and opportunities for the local inhabitants. As Dr. C.K. Prahalad stated in his book 'The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits',

*"Historically, governments, aid agencies, non-governmental organizations (NGOs), large firms, and the organized business sector all seem to have reached an implicit agreement: Market-based solutions cannot lead to poverty reduction and economic development. The dominant logic of each group is different, but the conclusions are similar."*¹¹

This dominant logic is now being challenged and disproved. The private sector's increased participation in a BOP-oriented market is gaining momentum in dismantling of this old paradigm. In the U.S., prestigious business schools such as University of Michigan Ross School of Business, University of North Carolina Kenan-Flagler Business School, and Cornell University Johnson School of Management are actively monitoring and tracking case studies associated with sustainable enterprises servicing and operating at the BOP. They are extracting and developing lessons learned, best practices, and business principles of what makes these enterprises successful. They are teaching these new principles, methods, and thinking to a new generation of students at both undergraduate and graduate levels.

What are the benefits for the private sector and large firms to service the BOP? What's in it for them?

*"The BOP market potential is huge: 4 to 5 billion (80% of humanity) underserved people and an economy of more than \$13 trillion PPP (purchasing power parity)."*¹²

Chart 1: Economic/Wealth Pyramid

Source: C.K. Prahalad and Stuart Hart, 2002, "The Fortune at the Bottom of the Pyramid"

According to the studies, the traditional products, services, and management processes will not work. The firms must be innovative to operate successfully in this sector. For multi-national corporations (MNCs), operations in the BOP sector can become a source of innovations for the developed markets as well.¹³ In today's increasingly competitive business environment, MNCs must continuously maintain their competitive advantage. Therefore, 'experimenting' in BOP markets is becoming compulsory rather than a 'nice' option or a charitable philanthropic activity.¹⁴ Many companies that are beginning to operate successfully in the BOP include:¹⁵

- Proctor & Gamble – Nutristar, Nutridelight (nutritional drink), Pur (water purifier)
- Unilever – Hindustan Lever (detergent for the poor in India and Brazil), Annapurna (iodized-salt for the poor)
- Shell – Making solar power affordable in India
- ABN-AMRO – Banco Real (micro-credit in Brazil)
- Hewlett-Packard – Solar powered digital camera in India and community information systems
- Coca-Cola – Program in South Africa to help entrepreneurs enter the supply chain and profit from new business ventures
- Suez – 'Water for All' program to periurban areas in Brazil

*"A wide variety of organizations, MNCs, local firms, and NGOs, are successfully innovating with vigor in these markets, and are making a great difference in the quality of life of low-income customers and low-income communities."*¹⁶

The perceptions of incompatibility in the past between the NGOs and the for-profit private companies are breaking down. As stated by Dr. H. Fisk Johnson, the Chairman of World Resources Institute and the Chairman and CEO of S.C. Johnson & Son, Inc.,

"Some might say linking 'global business' and 'sustainable development' is an oxymoron, but they would be sorely mistaken. All of us are tied together. We are all fundamentally linked, dependent on the same finite resources and driven by the same hopes for our selves and our children."

Dr. Johnson's statement signifies the gradual breakdown of cultural barriers, which prevented for-profit firms and not-for-profit organizations to work together in the past.

Civil-Military Operations.

Few people are aware that the U.S. military conducts a variety of humanitarian assistance (HA) and humanitarian civic action (HCA) projects around the globe. In FY 2005 at U.S. Pacific Command alone, we have budgeted approximately \$5.5 million in HA/HCA funding. Projects include building schools, hospitals, roads, community centers, digging wells, digging irrigation ditches, conducting water sanitation projects, providing rudimentary health care, providing training to local medical personnel, to name a few. We also provide disaster preparedness mitigation assessments for many countries throughout the Asia-Pacific region. We have provided many disaster relief efforts in natural disaster prone areas such as Bangladesh -- the most recent one for the Tsunami. Immediately following the Tsunami, we were able to quickly respond with relief efforts because we had our Army Civil Affairs Team (CAT) in the Banda Ache area conducting an assessment for several water sanitation projects.

During this Tsunami disaster relief effort, the military worked hand-in-hand with the Office of Foreign Disaster Assistance (OFDA), an arm of the U.S. Agency for International Development (USAID). USAID is the lead U.S. agency to extend assistance to countries recovering from disaster, trying to escape poverty, and engaging in democratic reforms. The agency's efforts support long-term and equitable economic growth and advances U.S. foreign policy objectives by supporting: economic growth, agriculture and trade, global health, and democracy, conflict prevention and humanitarian assistance.¹⁷ The combined effort during the Tsunami relief demonstrated to the leadership in both agencies the significant benefits derived from interagency coordination, combination of resources, and applying differing core competencies toward a problem.

At U.S. Pacific Command, we launched an effort to create a formal partnership with USAID to coordinate and synchronize our HA/HCA activities at a strategic level in January 2004. As we began to realize the importance of environment change aspects of the war on terrorism, we saw our routine HA/HCA activities as a solution -- providing some basic needs for the local populace. However, our efforts were isolated and one time occurrences in these communities. For example, we constructed a schoolhouse in a remote village, but it remained empty because the villagers could not afford the supplies and teachers needed to operate the school. Therefore, the local populace did not benefit from our efforts. Also, the villagers were not able to maintain the schoolhouse after the construction because they were poor and lacked funds. With this realization, we approached U.S.AID, the agency with the long-term vision and have the expertise in building community and development programs. Admiral William Fallon, Commander for U.S. Pacific Command, stated in his congressional hearing on March 8, 2005, "we are working to build a relationship with the U.S. Agency for International Development (USAID) with the intent to coordinate our Civil Affairs activities with USAID programs."

On March 30, 2005 the USAID announced that they have created the Office of Military Affairs (OMA) to coordinate and synchronize with the U.S. military. However up until now, the USAID has been ambivalent about working and coordinating with the U.S. military. This was due to the differing organizational cultures and perceived ideological conflicts between the two agencies. This is similar to the 'dominant logic' faced by the private sector and the NGO community as I have described above. The 'dominant logic' in the past was that military activities were incompatible with the USAID's humanitarian efforts. However, the creation of the OMA and Admiral Fallon's statement are the dawn of 'unfreezing' the rigid mindsets within these two organizations.

The Opportunity.

Based on the glimmer of 'unfreezing' of the institutional cultures and collaboration between what were previously unlikely allies, the Economic Advisor's Office at U.S. Pacific Command recognizes a new and emerging opportunity to make a significant impact on changing the environment. We should seize this opportunity with imagination, creativity and innovation. The question facing us now is how can we link all of them to alleviate poverty, to generate sustainable economic growth, and create hope and opportunities in areas that are vulnerable to terrorist recruitment and influence. We need to find ways to consolidate and

synchronize U.S. Pacific Command's efforts, USAID's programs, and NGO's charitable contributions, and the private enterprises' need for new markets to improve economic conditions at the BOP in countries like Cambodia, Indonesia, Philippines, etc.. This will definitely require entrepreneurial, out-of-the-box, and out-of-the-lane thinking by all parties involved. The 9/11 Commission criticized the U.S. government agencies for their lack of imagination prior to the event of 9/11. In the post 9/11 world, we have no choice but to think creatively and innovatively, if we are to win our fight against rising terrorist threats.

ORGANIZATIONAL CHALLENGES

The U.S. military as an organization has significant challenges to overcome in becoming an organization that fosters innovative and creative thinking. The current organization contains all of the six categories of obstacles that most bureaucratic organizations face: systems, structures, entrepreneurial thinking, policies and procedures, people, and culture.¹⁸ The current organization has very rigid systems, top-down management structure, absence of innovation goals in its strategy, long and complex approval cycles, short-term orientation due to frequent personnel turn-over (average 2-3 year), and it seems to be almost paralyzed by a risk-free (unwillingness to take risk) culture within the ranks of the decision-makers.

Systems:

Current military organizations have an overly rigid formal planning system with long cycles in combination with inflexible budgeting systems. Once a plan is approved, it is very difficult to change it. The budgets were approved at least two years ahead and it is very hard to redirect once it has been approved. The funding streams and funding categories are based on congressional budget allocations and therefore, the funds designated for a specific purpose cannot be redirected for another purposes without congressional approval. For example, U.S. Pacific Command staff components have been struggling to change the way the Humanitarian Assistance funds could be utilized; it is a congressional mandate that these funds are only to be used for disaster mitigation purposes, not to be used for capacity-building or reconstruction type of activities. In a post 9/11 world in Asia-Pacific region, the staff felt that it would be more useful and would have much greater long-term effect if they could redirect these funds toward capacity-building and reconstruction purposes.

Structures:

In a usual military tradition, the management structure is very much top-down. Those that are at the top make the policies and everyone below are expected to implement them. It is very hard for someone at an action officer level to get his/her point across to someone at the decision-making level. Several layers of screening, review and approval must be obtained before an idea/action is presented to someone with decision-making authority. Therefore, many innovative ideas/actions get snuffed out before getting up to the decision makers.

The inflexible organization structure in combination with rigid culture created a lot of silos among different divisions within the organization. The ability to integrate perspectives/methods across different sections/units/organizations is very limited. The most commonly used phrase in the military is "it's out of my lane" or "you are in my lane."

Entrepreneurial Thinking:

There is an apparent lack of commitment from the senior leadership to the principle of institutionalized entrepreneurship. This is because in general most of the senior leadership 'grew up' in the military. Many of them do not have any other experience beyond working within the confines of the military or the government organizations, which are not known for entrepreneurial thinking. Therefore, the concept of entrepreneurship is quite foreign to most of them. This creates leadership that is "typically cautious, suspicious, or completely unaware of efforts to break with tradition and capitalize on opportunity."¹⁹

Since middle- and lower-level leaders take their cues from those at the top of the organization, the cautious leadership style permeates through out the organization – this creates leaders that are well versed in the art of self-survival and self-advancement rather than taking necessary risks to further the objectives and goals of the organization.

Policies and Procedures:

The policies and procedures within the military strive to bring order and consistency to the everyday operational requirements of the organization. The approval cycles are long and require many managerial layers. Many action officers at the headquarters complain that they spend a significant amount of time presenting what they are planning to do and obtaining approval from various layers of management rather than actually executing the tasks and accomplishing the actual goals. Therefore, any innovative initiatives to fight a new kind of war such as the War on Terrorism get bogged down by the existing policies and procedures. This in turn causes us to miss a short window of opportunity when it is presented.

People:

Generally, most military personnel have a very short-term perspective. This is because the military has a very quick personnel rotating system – the personnel are required to rotate out of each position every 2-3 years. Not only it is a very costly practice to purposefully destabilize an organization, but it also causes people to think short-term. Therefore, most personnel focus on objectives that will show concrete results and goals that can be achieved within a 2-3 year timeframe. Therefore, it is difficult for the military to have its personnel focused on long-term efforts such as shaping the environment or affecting the underlying conditions that foster terrorism.

Culture:

Across the U.S. government, every agency, including the military, is acknowledging that innovation is needed. The military clearly recognizes that the nontraditional counterterrorism tools that are required to “deny sanctuary” and “diminish underlying conditions” are nonmilitary. According to General Richard Myers, Chairman of the Joint Chiefs of Staff, we must:

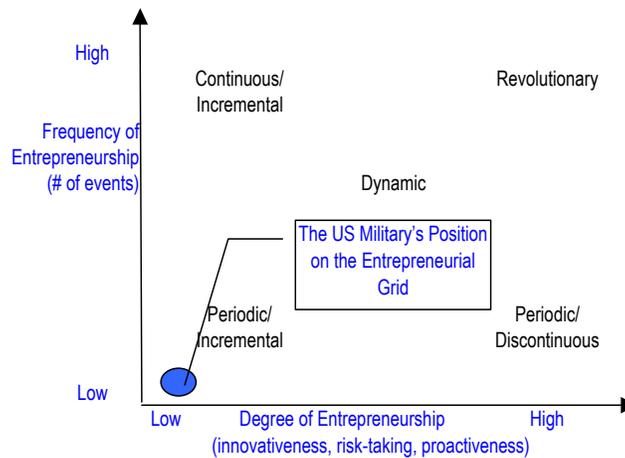
“transform our military competencies from joint operations to integrated operations that reflect the new partners we must coordinate with to defeat terrorists, such as other U.S. agencies, allied militaries and governments, nongovernmental organizations, and private industry”²⁰

to maximize our effectiveness. In the words of General Charles F. Wald, Deputy Commander, U.S. European Command,

“The tools of business are often better suited to diminishing the causes of terrorism...obviously this is outside the military’s lane.”²¹

He recognizes that a non-traditional-military solution is necessary to fight this war but that the military is not willing to use it. General Wald’s comment exactly reflects the mindset and culture that is preventing us from being able to think innovatively outside-of-the-box.

If we were to chart the entrepreneurship of the U.S. military on the Entrepreneurial Grid, it would be on the low/low sector of the grid.

Chart 2: The Entrepreneurial Grid

Source: Morris and Kuratko, *Corporate Entrepreneurship*, South-Western 2002, p.48.

We can continue to point out more examples under each of these categories of obstacles. However, the bottom line is that we have an uphill battle based on the presence of all six categories of obstacles within our organization to initiate the effort to innovatively search for non-traditional solutions -- non-traditional/non-military partnership efforts to address the environment and conditions that are the contributing to rising terrorism.

Linking the emergence of the BOP Concept to combating terrorism.

This effort will very much entail the employment of the 'coalitions of the willing.' Most private businesses are unlikely to engage in any activities that they perceive as having no potentials for profits. Up until now, the U.S. Government has not tapped into the power and capabilities of the private business sector in our GWOT strategy.

A recent Wall Street Journal article dated 26 May 2005 featured how a handful of private businesses such as FedEx, Western Union, AOL, and Wal-Mart are voluntarily assisting the federal law-enforcement agencies since 9/11. FedEx has mobilized its 250,000 employees to look out for possible threats, developed an internal computer system to report suspicious activity directly to the Department of Homeland Security, installed radiation detectors to sniff for dirty bombs at overseas facilities, opened its vast international shipping database to the U.S. custom. If we can have three more companies like FedEx participate in such effort, we would have 1 million people in addition to the law-enforcement actively looking out for possible threats.

How:

We need to 'mobilize' this untapped capability and opportunity existing in the private sector. The companies do not have to take drastic and proactive actions like FedEx has taken, they simply do what they do best -- create products, services, companies, and jobs. Leveraging the emerging BOP concepts and the MNCs increasing need for expansion of their market base, we may be able to inspire the business sector to operate in areas where economic development is sorely needed. We can provide an added incentive that they can significantly contribute to alleviating poverty, which in turn reduces hopelessness that foster terrorism, while they expand their market base and increase revenue.

The U.S. government agencies (including the military) should attend business associations meetings and conferences. We must educate our Civil Affairs and USAID personnel regarding these emerging concepts and trends in the business sector. We need to invite business leaders and decision makers to our CT conferences and seminars.

This concept is beginning to resonate at the U.S. Pacific Command. We co-sponsored a conference with U.S. Army War College and the National Intelligence Council in June 2005 to explore various means for the U.S. Government agencies and private sector to address the underlying conditions contributing to terrorism. We were able to get Dr. Stuart Hart (one of the well-known experts on the BOP concept) from Cornell University to speak at this conference to introduce the concept of the BOP and how it can help in addressing the underlying conditions by providing sustainable grassroots level economic development. We expect to have follow-on conferences and meetings to further discuss this complex issue of how to address the underlying conditions.

We plan to continue to introduce this concept in several of the upcoming CT Conferences and various other forums. We plan to invite some business leaders to these forums. We hope this will help spawn the thinking among the U.S. military and government decision makers about the connection between the War on Terrorism and the private sector. We also need to let the private sector know that the U.S. government and the international community need their business expertise in creating products, services, companies, and jobs in the BOP.

As the businesses become aware of the need and how their efforts of running successful businesses in the BOP arena could contribute to fighting terrorism, we will be able to 'mobilize' this untapped opportunity. The business sector can provide grassroots level microeconomic developments and a 'force multiplier' effect in our effort to fight terrorism. Using the business sector to fight terrorism requires very little costs for the U.S. government and in General Wald's words, it is the better tool suited to diminishing the causes of terrorism.

ENDNOTES

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⁶ Kim Cragin and Peter Chalk, "The Role of Social and Economic Development," 2002, RAND

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¹⁰ Prahalad, C.K., *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits*, p. 4.

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¹² Ibid, p. 21 and 61.

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MARITIME SECURITY, THREATS, AND CHALLENGES

• CHAPTER 5 •

Major Miemie Winn Byrd, U.S. Pacific Command

The Asia-Pacific stake in maritime security is significant. Many of the world's largest ports are in East Asia and much of their maritime traffic passes through key straits of Southeast Asia. The improved maritime transportation has been one of the lynchpins of the economic globalization and has fueled the region's dynamic economic growth. Recently, many nations in the regions have awakened to the magnitude of threats bearing on maritime trade infrastructure. Due to the region's heavy dependency on seaborne trade, their economies and the global economy can be seriously devastated by any prolonged interruption in maritime infrastructure. Therefore, the governments and international agencies are grappling to find the right balance between free trade and security.

MALACCA AND SINGAPORE STRAITS

It is over 600 miles long and only 1.5 miles wide at its narrowest point. Approximately 50,000 large ships annually and average of 45 oil tankers daily passed through the straits and the traffic is projected to increase as China and the region continued appetite for oil and energy consumption due to their dynamic economic growth.¹

If Malacca and Singapore Straits were closed, only two alternative waterways are available for international shipping: the Sunda Strait and the Lombok and Makassar Straits. A detour through these straits would add a significant amount of time and cost. By passing Indonesia will add one week to the voyage and a minimum of \$500,000 to the trip.² Increase in freight rates would jolt the economies of China, Japan, South Korea, and Taiwan which rely on imported energy for continued growth. A prolonged closure of Malacca and Singapore Straits could be disastrous for Singapore's economy. Singapore is the 19th largest trading nation and one of the world's most trade-dependent countries. The value of its trade is three times its GDP. An Average of 800 ships and 150,000 three times containers are in Singapore's port at any given time.³

Of all the major international straits, the Malacca and Singapore Straits are the most vulnerable to attack and the easiest for a terrorist group to block, with an exception of the Bosphorus and Turkish Straits. But the Malacca and Singapore Straits are far more vital to global seaborne trade.⁴

POSSIBLE THREATS

- Shipping and trade are among Islamic militant terrorists' prime targets, because an attack on the maritime transportation system would have a devastating and long-lasting impact on global trade and economy.
- Ships carrying crude oil, especially fuel and other heavy oils, toxic chemicals, petrol, ammonium nitrated, liquefied petroleum gas and liquefied natural gas could be used by terrorists as weapons to block or disrupt critical straits, waterways, and port-cities.
- Terrorists could attack a large tanker full of oil in the narrowest part of a vital waterway for international shipping such as the Straits of Malacca and Singapore.
- Terrorists could commandeer a vessel by posing as crew and then ground, sink or set it ablaze, spilling the oil and causing a major danger to shipping as well as an environmental disaster.
- Terrorists could pack a ship with explosives (including weapons of mass destruction (WMD)), bring it into the harbor of a busy port-city and detonate it there. It will create panic and cause many casualties, and major destruction.

- Terrorists are using piracy tactics to capture, board, and seize the vessels in port and in high seas. 70 percent of pirate attacks occur in harbors when ships are anchored.⁵

VULNERABILITIES

The international port system was not designed with security in mind. It was designed as an open, efficient network for moving goods and facilitating trade. The progression of this system was primarily driven by economic. Aside from security concerns arising from criminal theft and violence, security was never apart of designing the maritime transport infrastructure. Like wise, the industry that links this international trading network together – the global shipping business – not only lacks security in its fundamental design but it also nurtures certain structures and mechanisms that are perfectly suited to modern terrorist organizations looking to generate revenue, move people and resources, obtain weapons, and support and conduct offensive attacks, while hiding in plain site. Therefore, the shipping industry provides a ready-made cover for concealing, financing, incubating, and launching organized crime and terrorist operations.⁶

- **Flag of Convenience:** Since global shipping industry is intensely competitive, many ship owners register their vessels on open registers (flags of convenience) in foreign countries. Approximately 40 countries rent out their flags to foreign ship owners as a way of earning revenues. Some of them may not even have access to the sea. Most open registers do not require audited accounts from the shipping companies for registration. It is easy for the actual ship owner to hide behind a string of companies. Secrecy in the name of business confidentiality is a common practice in the flag of convenience system.⁷ Therefore, this system generally provides greater anonymity as well as tax benefits and lower costs than national registers.⁸

Most vessels operate beyond the visual range and awareness of authorities. In fact, they mostly operate in the anarchic environment of the high seas, which grants a total freedom to the operators. Some 40,000 large commercial crafts and countless smaller vessels are operating in an arguably the world's freest commercial framework. Meanwhile, the business milieu through which ships are owned, managed and registered is murky. Many if not all ship owners and operators have sought to conceal their identities for a range of legal and financial reasons. These numerous layers of concealment within the shipping industry and the number of international institutions and agencies involving in the regulation and monitoring of shipping companies make regulation and enforcement difficult. Therefore, the maritime domain provides an ideal environment for criminals and terrorist to easily maneuver, manipulate, and project operations.⁹

RISKS & COSTS

How much would a major terrorist attack on shipping or maritime infrastructure cost and what impact would it have on just-in-time delivery of supplies and goods for the companies? No one knows since such an attack has not happened yet. However, we can see several examples demonstrating how costly such disruption in shipping and maritime transport would be and how much it is costing so far to increase security measures.

- **U.S. West Coast Port Lockout in 2002:** a bitter dispute between unions and management shut down 29 ports on the U.S. west coast for almost two weeks. According to one estimate, the direct cost of delivery delay was \$467 million in U.S. dollars. However, this shutdown was foreseen and therefore many companies were able to take precautionary steps to minimize its impact. The importers with time-sensitive and perishable cargos faced the greatest losses during this shut down.¹⁰
- **Attack on Limburg in 2002:** Following the Limburg attack, Lloyd's of London tripled war risk premiums for ships calling at Aden and other ports in Yemen. The insurance premium for a ship carrying approximately 5,600 standard twenty-foot containers could be up to \$300,000 U.S. dollars. As a result, many vessels diverted away from these ports. The previously booming ports and terminals in the Yemen area and Aden were crippled by a drastic decrease in business activities. Singapore's PSA Corporation, which owned 60% of two-berth Aden Container Terminal, was forced to write off \$125 millions SG dollars

in loss and hand over the terminal back to Yemeni government who held 40% ownership in the venture.¹¹

- **Increased Insurance Premium Rates:** The direct cost of an attack is likely to be dwarfed by indirect costs linked to reactions to the attack, especially insurance. The heavy insurance payouts for damage to property and loss of life/injury following 9/11 have profoundly changed the business and legal environment in which ocean marine insurers and underwriters operate. They have become much more sensitive to terrorist risk at sea, in ports or indeed anywhere along the worldwide cargo container supply chain. Insurance premiums for ships, cargo, crew, and marine liability have risen across the board, while exclusions from insurance coverage have been tightened.¹²
- **Implementing New Security Measures for the Industry:** The OECD estimated that new security measures would cost the shipping and port industry an initial minimum investment of \$1.3 billion U.S. dollar and expected operating costs to increase by \$730 million U.S. dollars annually in subsequent years.¹³
- **Implementing New Security Measures in the U.S.:** The U.S. Coast Guard reported that the cost of implementing tighter security measure in U.S. ports is approximately \$1.5 billion U.S. dollars in the first year and \$7.3 billion U.S. dollars over 10 years.¹⁴

SOLUTIONS

The sheer volume of maritime traffic entering major ports each day complicates gathering maritime intelligence and achieving a secure maritime environment. There are simply too many vessels, containers, and crewmembers to screen and analyze each and everyone. To do so would upset the security-commerce balance, slow the global economy, and hinder the flow of trade. Sensitive just-in-time inventory models would collapse, companies would be forced to scale back operations, employment levels would be affected, and the global economy would suffer considerably.¹⁵ And of course the global nature of the shipping industry further complicates the issues; a ship might be owned by a company in one country, flagged by a second, crewed by the nationals of a third, and be carrying cargoes of a fourth through the territorial waters of a fifth, to the port of a sixth country.¹⁶

Therefore, the solutions are as complex as the problem. The solutions would have to address not only the security in a maritime domain, but they have to encompass the entire supply chain. The solutions would have to be multi faceted, multi levels, and multi national.

Offering Tax Incentives -- Singapore has launched an effort to reverse the flow to the national registry rather than going to the foreign open registries by offering tax incentives. The government cut corporate tax by 2 percent, and expanded tax exemptions for onshore chartering income for shipping that meets its Approved International Shipping Enterprise (AIS) scheme. The island-nation has been able to reduce the numbers of Singapore fleet flying foreign flags of convenience. Singapore has proven how tax and other inducements can be used to rebuilt national register while meeting international maritime safety standards.¹⁷

Reputable Ship Owners Act: International ship owners' organizations have developed guidelines for measuring the performance of states that register ships under flags of convenience against their legal obligations. Based these guidelines, they published a list of countries that score with significant negative indicators. The shipping companies flying the flags of these countries can face higher numbers of port inspections and expensive delays. This type of consequence may deter some of the companies from using the flags with negative performance indicators.¹⁸

The OECD Maritime Transport Committee is studying the various ways in which a cloak of secrecy can be created around the ownership of vessels. It will then identify best practices that would enhance transparency without breaching the confidentiality of commercially sensitive, but non-security-related, information.¹⁹

Encourage the Private Sector to Harness Technology: Governments could provide tax incentives for container companies to develop smart and secure containers with electronic seals, physical locking systems, satellite communication connections for tracking, and sensors to detect explosive, radioactive and harmful chemical or biological substances.²⁰

The Need for Multilateral/International Cooperation to Address Maritime Security: The awareness to cooperate is evidence in recent discussion in ASEAN Regional Forum (ARF) and Asia-Pacific Economic Cooperation (APEC) gatherings. The members are increasingly expressing their concern over the maritime security and showing increasing willingness to cooperate together to minimize and mitigate maritime threats. APEC has been active in promoting Secure Trade in the APEC Region (STAR) program, holding a series of seminars and conferences to publicize the new multilateral and bilateral maritime security measures and encourage all APEC economies to adopt them in a timely and coordinated manner.²¹ Although most of the concepts of cooperation have been in a discussion phase, it is obviously a step in right direction. In keeping with the ASEAN traditional process, rhetorical support for cooperation will eventually move forward over time to cautious, incremental cooperation.²²

United Nations International Maritime Organization (IMO): IMO has rigorously addressed the emerging maritime security concerns by the international community. IMO mandated the implementation of International Ship and Port Facility Security Code (ISPS Code) in July 2004. The new security measures are designed to put enormous pressure on all ships and ports that are involved in international trade to comply with the standards set by the IMO. The powerful trading nations/blocs such as the U.S. and European Union are also flexing their economic muscles to persuade the international shipping companies and ports to comply with new security standards.

- Failure by a port to comply with the security standards will allow other countries to delay or bar vessels, which visited that port. There could be high costs for non-compliers due to delays and inaccessibility.²³
- There will be offsetting benefits for those who comply. The benefits can amount to significant savings as the result of faster processing at ports, lower insurance costs, and fewer losses due to theft.²⁴
- The new security measures, when effectively applied and extended on a more universal basis, could help streamline global commerce as well as giving it greater protection. The security requirements will make it more difficult to falsify identification of goods for customs declaration purposes. This will reduce the scope for corruption and could lower transaction costs.²⁵

U.S. Role in Maritime Security: U.S. have played a significant role in promoting international cooperation and to enhance security in the maritime domain and ports. Currently, there are four programs and initiatives in effect:

- **Proliferation Security Initiative (PSI)** - To deter and disrupt proliferation of WMD, related materials and delivery systems transported on the sea, air, and ground.
- **Maritime Domain Awareness (MDA)** – To attain effective understanding of anything associated with the global maritime environment that could impact the security, safety, economy, or environment of the U.S.
- **Container Security Initiative (CSI)** – To ensure the safety of U.S.-bound shipment of cargo containers.
- **Regional Maritime Security Initiative (RMSI)** – To enhance capabilities of willing nations to leverage capacities through unity of effort to identify, monitor, and intercept transnational maritime threats in Asia-Pacific region.

The severity of the maritime threat has lead Admiral Thomas Fargo, Commander of U.S. Pacific Command, to propose the RMSI in 2003, an attempt to promote regional cooperation to improve maritime security in the region, especially in the Straits of Malacca and Singapore. This initiative's goal is to develop a partnership of willing nations who work together to identify, monitor, and intercept transnational maritime threats under international and domestic law. This cooperative effort will maximize the application of available resources so that each participating nation has timely information and the capability needed to act against maritime threats in its own territorial seas and contribute to regional maritime security efforts. Information sharing will contribute to the security of international seas, creating an environment hostile to terrorism and other criminal activities. The ultimate decision to participate in maritime security activities, including information sharing

with other states or acting against a threat remains voluntary and sovereign for each nation. This initiative will leverage technology to build and share a clear picture of the maritime environment, emulating the current picture of international space.²⁶

Asia-Pacific has as much, or more, to lose if the Straits of Malacca and Singapore become an operational theater for terrorist groups. Reducing the vulnerability of these straits to maritime crime of any kind is essential to the region's security and economic stability. The consequences of inaction and delay would reverberate around the world.²⁷

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DEFENSE ECONOMICS

• CHAPTER 6 •

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The Asia-Pacific region has long been a major market for advanced conventional arms. Since the beginning of the 21st Century, in fact, the region has become the *largest* buyer of weaponry and military equipment. During the period 2000-2003, the Asian-Pacific countries (not including Australia and Japan) purchased \$33.8 billion worth of arms, accounting for 51 percent of all such agreements and overtaking the Middle East – traditionally the world's largest arms market – for the first time. During the same period, the Asia-Pacific took delivery of \$35.4 billion worth of arms.¹

Some of the world's biggest arms buyers are found in the Asia-Pacific. Five of the developing world's ten largest arms importers – Taiwan, China, South Korea, India, and Pakistan – are found in this region. Taiwan, for example, took delivery of \$19.4 billion worth of foreign weapons systems during the period 1996-2003, and it was second only to Saudi Arabia in overall arms imports. During this same timeframe, China imported \$10.2 billion worth of arms; South Korea, \$8.3 billion; India, \$6 billion; and Pakistan, \$4.3 billion.²

There are few signs that regional appetites for advanced armaments will abate anytime soon. Beijing, for example, has since 1999 signed new arms import agreements in excess of \$12 billion; in 2002 alone, it purchased \$3.6 billion worth of foreign weapon systems. At the same time, Chinese military expenditures have more than trebled in real terms since the mid-1990s; China's official 2005 defense budget is 248 billion yuan, or \$30 billion – a 12.6 percent increase over the previous year and thus continuing a decade-long trend of double-digit real increases in Chinese military spending.³ For its part, Taiwan intends to spend more than \$15 billion over the 15 years on new military equipment, including eight diesel-electric submarines, P-3C antisubmarine warfare (ASW) aircraft, and PAC-3 anti-ballistic missiles; much of the funding for these programs will come out of a special appropriations budget separate from the annual budget for Taiwan's military. India recently increased its military budget by 7.8 percent to \$19 billion, while South Korea plans to invest more than \$28 billion in modernizing its armed forces between 2004 and 2008; as an initial down payment, Seoul increased its procurement budget by ten percent in 2004 and by another 16 percent in 2005.⁴

Given the size and strength of the Asia-Pacific arms market, it is not surprising that this region has become a critical market – and therefore the object of particularly fierce competition – for the world's leading arms suppliers, particularly the United States, Western Europe, Russia, and Israel. Nearly all the leading arms-producing countries have come to rely heavily on arms exports to the region. As such the Asia-Pacific simply becomes one more area of economic rivalry for these supplier-states, it is legitimate to ask what might be lost in the contest. If economic drivers increasingly crowd out strategic rationales, it is regional peace and stability that may suffer.

THE GROWING ECONOMIC IMPERATIVE TO EXPORT ARMS

Nations have many reasons for exporting arms. Great powers and aspiring great powers – such as the United States or the Soviet Union, or, more recently, China – often used overseas arms sales as a means of promoting military-strategic objectives, i.e., strengthening alliance relationships, bolstering allies, and promoting interoperability. Arms exports can also be an important method for demonstrating geopolitical patronage and influence – signifying a patron-client state relationship – or as a form of geostrategic signaling – for example, as an indicator of a security guarantee, as in the case of U.S. arms sales to Taiwan, cautioning China that Washington is committed to Taiwanese freedom and self-determination.

In recent years, however, economic considerations have increasingly dominated the drive to export arms. The fiscal pressures to export arms have been increasingly felt among the leading arms-producing states in the West and Russia as military expenditures have declined since the end of the Cold War, subsequently drying up national markets for local arms industries and their products. Between 1990 and 2003, for

example, British defense spending fell nearly one-quarter, while Germany's defense budget shrank by 27 percent. French and Italian military expenditures declined by eight and ten percent, respectively, over the same time period.⁵ Russian defense spending fell even more precipitously during the 1990s – from \$79 billion in 1990 to a low of \$7.1 billion in 1998, before rebounding slightly to \$13 billion in 2003.⁶

Arms exports in general have become increasingly crucial to the world's leading arms producers, therefore. European defense firms are highly dependent upon foreign markets. BAE Systems, for example, typically does 70 to 75 percent of its business outside the United Kingdom, as does Thales of France. Eurocopter, a subsidiary of the European Aeronautic Defense and Space Company (EADS), exports more than two-thirds of its output. Israeli arms producers overall export around 80 percent of their output, around \$3 billion worth in 2004.⁷ The Russian defense industry also has a "substantial dependence" on export business. According to one Western analyst, "in 1999 [Russian] military exports represented 34 percent of its total output...whereas military production for domestic procurement was only 20 percent."⁸

U.S. defense firms, with their huge domestic arms market, have traditionally been under much less pressure than their European and Russian counterparts to export arms. Despite recent increases in defense spending, however, the Pentagon's procurement budget is still less than what it was during the height of the Reagan buildup – \$78 billion in fiscal year (FY) 2005, versus \$117 billion in FY1987 and \$105 billion in FY1990 (all expressed in constant FY2005 dollars) – pressuring arms producers to go abroad in search of new markets to compensate for shrinking ones at home.⁹ Overseas sales have become particularly critical when it comes to certain weapons systems, such as the M-1 tank and the F-16 and F-15 fighters, which are now exclusively produced for foreign markets.

As these economic requirements have become paramount, supplier restraint has been replaced by a readiness on the part of the major arms producers to sell to the Asia-Pacific just about every type of conventional weapon system available. In addition, Europe and Russia have often used technology transfers and offsets as inducements to make an arms sale, even though these activities can pose considerable proliferation concerns. Germany, for example, has transferred submarine production technology to South Korea, while Russia has licensed the production of its Su-27 fighter jet to China. U.S. arms producers have also become much more aggressive in pursuing exports, and the U.S. government has been increasingly willing to lobby hard for arms sales in support of its defense industry. In particular, Washington has become much more permissive when it comes to the overseas release of some of the country's most advanced military systems. This policy have even been applied to state-of-the-art U.S. weapons systems that are still in development, such as the Joint Strike Fighter (JSF) project, for which codevelopment partnerships have been offered to Singapore and Australia, to name but a few partnering countries.¹⁰

Nearly all the leading arms-producing countries have come to depend heavily on sales to the Asia-Pacific. The Asia-Pacific region is a particularly crucial market for the Russian arms industry. During the period 2000-2003, the region accounted for 82 percent of all Russian sales – and 85 percent of its deliveries – to the developing world.¹¹ Russia was also the largest arms seller, in terms of agreements, to the Asia-Pacific during the period 2000-2003, with \$16.5 billion worth of arms sales and capturing 49 percent of the market. Deliveries of Russian arms to the Asia-Pacific have more than doubled in recent years, from \$5.4 billion in the 1996-1999 timeframe, to \$11.6 billion in 2000-2003.¹² The Asia-Pacific region has, in fact, become the single largest market for Russian arms, even larger than Russia itself.¹³

China and India are Russia's principal arms customers – not just in the Asia-Pacific but globally as well. Over the past decade, Russia has sold Su-27 and Su-30 fighters, Sovremenny-class destroyers, Kilo-class submarines, and S-300 surface-to-air missile (SAM) systems to China, and Su-30 fighters and even an aircraft carrier to India. Moscow has also made major inroads in selling to Southeast Asia, and in 2003 it closed deals with Malaysia for Su-30MK fighters and Mi-171 helicopters; with Indonesia for Su-27 and Su-30 fighters and Mi-35 attack helicopters; and with Vietnam for Su-30 fighters, S-300 SAMs, and Molniya-class missile attack boats.¹⁴

The leading West European arms producers – the United Kingdom, France, Germany, and Italy – together sold \$4.4 billion to the Asia-Pacific during the 2000-2003 timeframe, capturing 13 percent of the regional market. Sales to the region accounted for fully 50 percent of the United Kingdom's, 81 percent of France's, and 91 percent of Germany's total arms agreements with the developing world. Combined deliveries for these four countries during this period totaled \$2.8 billion. Other European countries also depended greatly upon the Asia-Pacific arms market (41 percent of arms agreements, and 25 percent of arms exports).¹⁵ Examples of recent European arms sales to the Asia-Pacific include British Hawk trainer jets to India, German Type-214 submarines to South Korea, and French Lafayette-class frigates to Singapore.

Israel has become particularly active in transferring arms to the Asia-Pacific. Israel has become India's second-largest arms supplier, after Russia, and in recent years, it has exported more than one billion dollars worth of arms to New Delhi, including the Green Pine ballistic missile early warning radar, Barak ship-launched air-defense missiles, and unmanned aerial vehicles (UAVs). In 2004, Tel Aviv closed a deal to sell three Phalcon airborne early warning aircraft to India for \$1.1 billion. Other Israeli arms deals in the region include Barak and Python air-to-air missiles to Singapore, Popeye air-to-ground missiles and Harpy anti-radar drones to South Korea, Kfir fighter jets to Sri Lanka, and UAVs to the Philippines.

Even the United States has come to regard this region as a "must-have" market, and 47 percent of its arms exports went to the Asia-Pacific during the 2000-2003 timeframe.¹⁶ In terms of deliveries, the United States was the leading defense exporter to the Asia-Pacific region during 2000-2003, transferring some \$16.36 billion worth of arms. Only the Middle East was a larger arms market for the United States, and just barely at that. Moreover, while U.S. arms exports to the Middle East have fallen in recent years – from \$27.3 billion during the 1996-1999 timeframe to \$16.4 billion in 2000-2003 – deliveries to the Asia-Pacific have actually risen, from \$13.9 billion during 1996-1999 to \$16.36 billion in 2000-2003.¹⁷ The United States has particularly dominated in the marketing of advanced fighter aircraft to the region, selling F-16s to Indonesia, South Korea, Singapore, and Taiwan, F/A-18s to Malaysia, and F-15s to South Korea. Washington recently approved the sale of new F-16s to Pakistan and has offered both the F-16 and F/A-18 to India.

CONVENTIONAL ARMS PROLIFERATION TO THE ASIA-PACIFIC: TWO KEY ISSUES

As economic motivations – that is, the preservation of vital industrial sectors, protecting jobs, etc. – increasingly edge out political-military considerations when it comes to international arms transfers, there are legitimate concerns that the drive to export may take on a life of its own. An "everything-must-go," "crazy-Eddy" approach to overseas arms sales can often lead to extreme marketing techniques, such as cutthroat pricing, excessive offsets, and substantial technology transfers packages. For example, when Seoul recently selected the Boeing F-15K as its new fighter aircraft, it came with a sizable offset arrangement (equal to more 80 percent of the cost of the program) and a promise by Boeing of 29 technology-transfer ventures to help South Korea develop its own fighter by 2015.¹⁸ The fear, of course, is that short-term economic gains will take precedent over longer-term strategic considerations of regional security and stability, or that such sales could drive a wedge between friends and allies, further disturbing the regional security calculus. These concerns can be seen in at least two cases of advanced conventional arms transfers to the Asia-Pacific region.

Arms Sales to China.

The continuing Chinese arms buildup is a major concern to the United States. The potential impact of growing Chinese military power has considerable implications for U.S. security interests in the region. China's readiness to confront the United States politically, economically, and militarily in Asia – especially over Taiwan, but also in the East and South China Seas, and elsewhere in the region – could rise as its military strength increases. A stronger and more assertive China would greatly complicate the U.S. security calculus in the region.

There is general agreement among the U.S. China-watching community that Beijing has been engaged since the early 1990s in a determined effort to modernize its armed forces, the People's Liberation Army (PLA), in order to fight and win "limited wars under high-tech conditions." This doctrine revolves around short-duration, high-intensity conflicts characterized by mobility, speed, and long-range attack, employing joint operations fought simultaneously throughout the entire air, land, sea, space, and electromagnetic battlespace, and relying heavily upon extremely lethal high-technology weapons.¹⁹

Much of this critical hardware for limited, high-tech war is imported, mostly from Russia. Russia currently supplies more than 80 percent of Beijing's foreign-sourced arms. Between 1995 and 2002, China imported some \$9 billion worth of arms from Russia. China is buying up to 12 *Kilo*-class submarines and four *Sovremenny*-class destroyers from Russia; the *Kilos* are armed with the 3M-54E Novator Alpha antiship cruise missile (ASCM) and the 53-65KE wake-homing torpedo, while the *Sovremenny* is equipped with the SS-N-22 Sunburn supersonic ASCM. In addition, by the end of the decade, the PLA could deploy over 300 Su-27 and Su-30 fighters, equipped with standoff AA-12 air-to-air missiles and a variety of Russian-supplied surface-to-air precision-guided munitions. Just as important, Moscow is an important source of foreign technological-industrial assistance to China's defense industry. China last year launched a new Type 094 nuclear-powered ballistic-missile-carrying submarine (SLBM) and is currently constructing a new class of nuclear-powered attack submarines (the Type 093), both of which are based heavily on Russian technology.

Russian arms sales to China are an ongoing source of friction between Washington and Moscow; even some Russians have expressed concerns over supplying China with too much military technology. However, so long as the Russian defense industry depends so heavily on arms exports to China, this issue will continue to vex the U.S.-Russian relationship regarding mutual security interests in the Asia-Pacific.

Compounding this issue is the increasing likelihood that the European Union (EU) may soon lift its 16-year-old embargo on arms exports to China. Western Europe has largely ceded the Chinese arms market to Russia and other countries not participating in the ban – in this sense, therefore, the EU arms embargo is a classic "prisoner's dilemma." And the European defense industry clearly suffers much more from the embargo than do U.S. arms producers. The European defense industry is nearly as dependent on arms exports as is Russia's, while the U.S. defense industry has the benefit of a domestic defense market four times larger than all of Europe combined, as well as regularly capturing around half of the international trade in arms.

To Europe's arms manufacturers and their governments, China is just another market; moreover, with Europe's strategic withdrawal from East Asia (for example, Britain's 1997 handover of Hong Kong to Beijing), security issues involving the region do not affect the EU as much as they do the United States. Lifting the embargo could come at the price of further damaging a transatlantic alliance already strained over Iraq and other issues – the U.S. Congress has already threatened retaliation if the EU overturns its ban, such as restricting military exports and technology-sharing with European countries that sell arms to China, as well as barring the Defense Department from doing business with any European company that engages in defense business with China. At the same time, Washington has not been able to adequately convey to the Europeans that China constitutes an actual or potential threat to Europe, and that they should therefore restrict sales to military items.

Proliferating New Capabilities to the Asia-Pacific.

As a result of recent arms imports many countries in the Asia-Pacific have over the past decade greatly expanded their warfighting capacities beyond the mere modernization of their armed forces. In fact, militaries in the region have over the past decade added capabilities that they did not possess earlier, such as new capacities for force projection and stand-off attack, low-observability (stealth), and greatly improved command, control, communications, computing, intelligence, surveillance, and reconnaissance (C4ISR) networks. Consequently, many Asian-Pacific military now deploy or will soon acquire several new weapons platforms, advanced armaments, or sophisticated military systems. For example:

China, India, South Korea, Malaysia, Singapore, and Taiwan have either expanded or else are in the process of expanding their blue-water navies with modern foreign-built or foreign-designed destroyers, frigates, missile patrol boats, and diesel-electric submarines. Many of these warships incorporate stealthy designs and are equipped with state-of-the-art ASCMs, air-defense systems, and torpedoes.

- Thailand has acquired a small aircraft carrier from Spain, and India has recently concluded an agreement to purchase a used, refurbished and re-equipped carrier from Russia.
- China, India, South Korea, Malaysia, and Singapore have all received or else will soon acquire tanker aircraft for air-to-air refueling.
- Nearly every Asia-Pacific country currently possesses at least some “fourth-generation” fighter aircraft, such as the Russian Su-27, Su-30, or MiG-29, the U.S. F-16 or F/A-18, and the French Mirage-2000. Just as important, most of these aircraft are equipped with advanced active radar-guided air-to-air missiles, such as the U.S. AMRAAM or the Russian AA-12.
- China, Singapore, and Taiwan have recently acquired airborne early warning (AEW) aircraft, while India and Korea intend to buy AEW aircraft in the near future.
- India and Taiwan have plans to acquire missile defenses, either in cooperation with other countries or through the purchase of off-the-shelf systems.

The acquisition of these new military capabilities has two repercussions for militaries in the Asia-Pacific. At the very least, these new types of armaments promise to significantly upgrade and modernize the manner of warfighting in the region. Certainly, Asia-Pacific militaries are acquiring greater lethality and accuracy at greater ranges, improved battlefield knowledge and command and control, and increased operational maneuver and speed. Standoff precision-guided weapons, such as cruise and ballistic missiles and terminal-homing guided munitions, have greatly increased combat firepower and effectiveness. The addition of modern submarines and surface combatants, amphibious assault ships, air-refueled combat aircraft, and transport aircraft have extended these militaries’ theoretical range of action. Advanced reconnaissance and surveillance platforms have considerably expanded their capacities to “look out” over the horizon and in all three dimensions. Additionally, through the increased use of stealth and active defenses (such as missile defense and longer-range air-to-air missiles), local militaries are significantly adding to their survivability and operational capabilities. Consequently, conflict in the region, should it occur, would likely be more “high-tech:” faster, more long-distance and yet more precise, and perhaps more devastating in its effect.

More important, many Asia-Pacific militaries are acquiring the types of military equipment that, taken together, could fundamentally change the concept and conduct of warfare. In particular, those systems related to precision-strike, stealth, and above all C4ISR comprise some of the key hardware ingredients essential to implementing a revolution in military affairs. Sensors, computers, communications systems, automated command and control, electronic warfare systems, advanced navigation and targeting aids, and “smart” weapons can be bundled together in innovative new ways that could greatly synergize their individual effectiveness and create new “core competencies” in warfighting. These emerging capabilities, in turn, have the potential to significantly affect strategy and operations on tomorrow’s battlefield and hence to alter the determinants of critical capabilities in modern warfare. At the very least, therefore, the countries of the Asia-Pacific region increasingly possess the kernel of what is required to transform their militaries.

CONCLUSIONS

The impact of recent Asia-Pacific arms imports on regional security is still uncertain. Countries, of course, have the right to legitimate self-defense, and therefore the right to maintain armed forces with sufficient capabilities to meet their perceived requirements; in this regard, many arms imports can be viewed as “security-building.” On the other hand, the introduction of new types of arms and, therefore, unprecedented military capabilities into a region can have many unintended consequences. They can, for example, create or exacerbate arms races that, in turn, could seriously disturb or even destabilize regional or bilateral military

balances (such as China-Taiwan, or India-Pakistan), leading to more insecurity and instability in the region. In particular, the spread of the most advanced conventional weapons could have an adverse effect on regional security environments where tensions are already high, such as the Taiwan Strait. Beijing's growing arsenal of Russian-supplied warships, submarines, fighter aircraft, and precision-guided munitions has certainly increased Taiwan threat perceptions of China, and it has fueled Taipei's counter-acquisition of new air and missile defenses, anti-submarine and anti-surface warfare systems, and counter-landing weapons. Yet, as these militaries become more capable, the situation across the Taiwan Strait has not necessarily become less tense – just the opposite, in fact, as armed forces on both sides increasingly test each other's strengths and weaknesses in the strait. Such concerns are only multiplied when one considers the types of military systems being acquired – transformational weapons that promise to fundamentally change the conduct of warfare and which could greatly increase its destructiveness.

Secondly, without necessarily leading to arms *races*, these new arms acquisitions can lead to very expensive, and ultimately imprudent, arms *competitions*. For example, South Korea's efforts to acquire a blue-water navy (complete with a large fleet of ocean-going submarines), intended to rival Japan's and China's maritime forces, could have the effect of drawing resources away from defending against an attack from North Korea. Additionally, when it comes to the poorer countries in the Asia-Pacific, one might question the wisdom of such arms purchases from an economic aspect, particularly if these acquisitions divert considerable funds away from more pressing social needs.

It is also legitimate to question whether some of these countries actually “need” such increasingly sophisticated armaments. This is particularly apropos when it comes to Southeast Asia: Does Thailand have a “legitimate” military requirement for an aircraft carrier, especially one that was so expensive to acquire and to operate and is of such little strategic value? Should Western countries sell certain types of armaments – such as modern submarines or AMRAAM-type air-to-air missiles – to countries in the Southeast Asia when the release of such weapons systems could have far-reaching implications for regional security dynamics?

At the same time, the acquisition of more advanced weapons by U.S. allies and friendly countries could further regional security, both by strengthening bilateral military alliances and aiding interoperability and burden-sharing with U.S. forces in the region. For example, our closest allies in the region (Australia, Japan, and South Korea) have over the past decade imported more than \$50 billion worth of arms in order to modernize their armed forces. This enhanced interoperability could be especially crucial as the United States continues to transform its armed forces along the lines of the information technologies-based revolution in military affairs, as it would permit Asia-Pacific allies to tie into U.S. concepts of net-centric warfare. For example, Japan and South Korea are both acquiring the Aegis naval sensor and combat system, which could enable to their ships to link up with U.S. naval forces in cooperative engagements against opposing forces, or, as in the case of Japan, permit these nations to work with the United States in developing and deploying ship-based missile defenses.

The Asia-Pacific will continue to be an important arms market and an increasingly avid consumer of advanced weapon systems. As already noted, many of these recent arms imports go beyond mere modernization, and are greatly expanding the capabilities of local armed forces when it comes to force projection, precision-strike, and battlespace knowledge and command and control. These developments, in turn, are injecting new uncertainties into the regional security calculus. At the very least, therefore, the interested parties concerned with peace and stability in the Asia-Pacific should continue to carefully monitor how much these new types of armaments might complicate future mutual security assessments and military planning in the region.

ENDNOTES

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TOWARDS FOOD SECURITY

• CHAPTER 7 •

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The place is Beijing, China, 17-21 May 2004. The conference is the 27th UN Food and Agriculture Organization (FAO) Regional Conference for Asia and the Pacific. Policymakers, bureaucrats, and environmentalists have descended on this city for another food security conference. The meeting is polarized between the pessimists (latter-day Malthusians) and the optimists, whether technologists or those dedicated to modifying the behavior of food producers and consumers. Each group believes itself to represent realism.

Many of the attendees are alarmed about clear signs that the world is running out of food, characterized by images of people starving in Somalia in 1992. They're quick to tell you that the famine in Somalia is merely representative of the ongoing food crises in Africa and parts of South Asia. They remind you that as recently as 1983 and 1984 a million Ethiopians died in another terrible famine.

Attendees from the other camp see things differently.¹ Their world generally faces a food glut; they pay their farmers handsomely not to grow food, in order to avoid surplus. Their farmers also have been frustrated as prices of agricultural commodities have declined in the past 15 years; they make the case that other lines of work are far more promising than agriculture. Throughout the conference the two groups would remain worlds apart.

So, too, are the regions described in this article and the kinds of problems that affect them. Food problems in Africa, primarily sub-Saharan Africa, are most often characterized by insufficiencies due to war, civil strife, flawed government policies, and poverty. The latter is defined as the inability to purchase the minimum amount of foodstuffs to sustain life, even in periods of relative plenty. Hence world response to these conditions has taken the form of relief efforts to solve immediate problems, sometimes with little official regard for long-term effects of the interventions on domestic agricultural markets.

Food problems in China, as best we can discern, are different from those in Africa in both form and scope. Whereas sub-Saharan food crises have been with us in increasing numbers for several years, with no imminent prospects for slowing the trend, China's challenges lie mostly in the future. Its enormous and growing population has the potential to destabilize agricultural production throughout the world. Its growing affluence has begun to increase demand for meat products, sustainable only by increasing its production and imports of grains. And whereas the plight of individual African states will have limited effect on the well-being of other regions, China's size and location make it inevitable that its claim to the wherewithal to feed its people in 2020 could indeed affect contiguous states as well as distant regions capable of producing grain surpluses.

Clausewitz reminds us that "the first, the supreme, the most far-reaching act of judgment that a statesman and commander have to make is to establish . . . the kind of war on which they are embarking; neither mistaking it for, nor trying to turn it into, something that is alien to its nature." That admonition applies equally to the strategist seeking to understand what motivates or deters other states in a time of relative peace. For a while during the oil crisis of the 1970s, food was sometimes called the green weapon, apparently on the assumption that the embargo of one commodity could be countered by the embargo of another. At the time, no one took the concept very seriously. Now, however, with the world's population half again what it was at that time, food—who has it, who doesn't—and the arable land from which it is produced become legitimate strategic considerations.

This article explores aspects of world agriculture and suggests ways to examine and think about arable land and the world food supply, considerations that strategists are sometimes too quick to dismiss. Some support one or another of the two opposing views, because of folk wisdom or prejudice. Some believe that the "world is full of food"; others believe that little can be done to avert starvation in Africa. Still others argue that the world food supply is not vital to U.S. national interests. Common to all views often is a lack of opportunities to examine the matter in depth.

To encourage the study of food and arable land as strategic assets, this article addresses the supply of food worldwide, and to a lesser degree, the demand for it.² It looks at factors that determine the supply of food and at circumstances that can alter--for better or worse--the ability of producers to keep pace with demand. Most important, it examines the implications of success or failure to maintain a supply of basic foodstuffs that stays just ahead of the demand. Strategists need a clear, even if rudimentary, understanding of the forces that determine whether tens of millions of people will live lives of feast or famine. Such an understanding will help them shape national policy on matters with potentially unprecedented peacetime consequences.

THE DEMAND FOR FOOD

A number of considerations shape the worldwide demand for food. Key among them are population growth, social upheavals that disrupt domestic food production and contribute to humanitarian disasters, and the amount of grain consumed indirectly by relatively affluent societies as they satisfy their newfound desire for meat.

Demographics.

The world's population has now reached almost six billion. At current growth rates it could double by the year 2035 unless states take decisive actions to address the problem.³ Relentless population growth--whatever else happens to the demand for food--means that we will have many more mouths to feed each year than the year before. One policy option is to reduce the rate of growth of the world population.

The investment that promises the biggest short-term payoff in controlling population growth is making sure that safe and effective family-planning methods are universally available. Additionally, the inequalities between the sexes that exist in many developing countries also should be addressed; it has been demonstrated that educated and emancipated women know how to space their pregnancies.⁴ Poor countries also desperately need stronger economic development, which in turn reduces the social demand for large families.⁵ While none of this is easy to implement culturally or politically, the simple truth is that rapid population growth is one of the few solvable problems in an otherwise complicated world.

Humanitarian Disasters.

A number of African nations, notably Ethiopia, Sudan, Angola, Liberia, Zaire, Mozambique, and Malawi, are permanently threatened by famine. Food shortages in South Asia raise similar fears; many fret as well about the 800 million people (also mostly in Africa and South Asia) who are chronically hungry and undernourished. The frequency and scale of humanitarian crises that require the international community to overcome food shortfalls with food aid have increased substantially in recent years. The number of recipients of UN humanitarian assistance jumped from one million in 1970 to 17 million in 1993. Food aid for UN emergency relief operations has grown correspondingly, from one million metric tons in 1979-80 to 4.5 million metric tons in 1993-94.⁶

At first glance, events in Africa and South Asia seem to confirm the theories advanced in 1798 by Thomas Robert Malthus, the English economist who gave his name to predictions of mass starvation.⁷ The Malthus thesis is that populations will always outstrip the food supply because food supplies grow arithmetically while populations grow geometrically. China's Hung Liangchi recently paraphrased Malthus: "The population, within a hundred years or so, can increase from fivefold to twentyfold, while the means of subsistence . . . can increase from three to five times."⁸ Pessimists claim that the food shortfall in Africa and South Asia is merely the tip of the proverbial iceberg. They claim that food shortages in those regions are indicative of something far more ominous: the world food supply--the total amount of food available to all of the people in the world--is being squeezed. If they are right, humanity itself can ultimately be at risk.

Livestock.

As people improve their living standards, especially through increased income, they usually eat more food. Also they generally begin to eat more meat, which requires an enormous amount of grain to feed their livestock. Beef cattle are especially inefficient in this respect, producing only one pound of meat for every eight to ten pounds of grain they consume. Compared to a pound of beef, however, that same eight pounds of grain can supply about ten times as many calories and more than four times as much protein when consumed directly by humans.

In the past, almost all beef cattle grazed on grass and other forage up to the time they were slaughtered. But since the mid-1900s, many feed lots--they fatten cattle on grain--have operated in the United States and Canada. Most beef cattle are fattened there, consuming enormous quantities of grain in the process.⁹ In effect, livestock consume more calories and protein than they produce; even chicken requires roughly two kilos of grain to produce a kilo of edible products.

To help redress this inefficient conversion of grain to calories, the United States could take the lead in helping to reduce the demand for feed grain for livestock in two ways. First, the demand for grain could decline significantly if the cattle industry raised some of its animals chiefly on forage. Second, the demand for feed grain would decline if we simply decided to eat less meat. Most people in the United States, for example, could probably reduce their meat consumption as much as 30 percent without ill effects; Americans consume more than four times as much grain, partly through meat products, as do people in developing countries. The demand for grain is also increasing because affluent people in newly prosperous places like China can afford to eat more, especially more meat.¹⁰ So restraint in meat consumption could gradually increase the amount of calories and protein available for human consumption as grain products.

Social Demand.

It is useful to make a distinction between economic demand for food and what can be called social demand for it. When economists use the word *demand*, they generally refer to market demand in the context of purchasing power and price. But since poor people who cannot afford food are not part of the marketplace for grain, talking about the economic demands for food in the world ignores a large segment of humanity. It also helps to explain why there can be food scarcity in Africa and South Asia in the midst of a surplus of food in places like the United States and the European Union (EU) countries.

The social demand for food reflects population increase and the tendency for increasing affluence to be accompanied by increased consumption of food, particularly meat. In this sense, the concept offers a more complete description of aggregate demand for food than does market demand. Social demand identifies the quantity of food the world needs to feed all of its people, irrespective of commercial demand for grain in the marketplace. Quantifying the social demand can help us to reconcile the usually conflicting views of the pessimists and the optimists. And if we can think of the world food supply in such a holistic context, we discover that the social demand for food is increasing. Living standards plunge when population outstrips economic growth, creating conditions for social unrest and civil war. And when marginal or depleted natural resources--land and water--can no longer support growing populations, conflicts can arise as desperate people become refugees and seek their livelihood in neighboring countries.¹¹

The finding that social demand for food is growing has strategic consequences. Countries with an abundance of food cannot ignore the problem of global mismatches between populations and foodstuffs, whether the mismatches are intermittent or permanent. The condition demands responses; it creates the kind of imperative that RAND Corporation's Marten Van Heuven frequently refers to: "Either you visit the problem, or the problem will visit you." The debate will continue over whether the relationship between anticipated population growth and arable land is cause for concern or merely a phase. The prudent individual or state, however, should be looking for hedges in the event the emerging scenario is Malthusian. All conflict, someone has observed, can be traced to resources.

THE SUPPLY OF FOOD

Whether the world can grow enough grain to meet increasing social demand for food depends on several factors; the amount of food a country produces is determined in large measure by its agricultural resources--arable land, water, energy, and fertilizer. Of these, land and water are obviously the most important. Crop land must be fertile and fairly level; water can be from rainfall, irrigation, and in some limited instances, desalinization processes. In addition, many farmers depend heavily on energy resources, particularly petroleum fuels, to operate tractors, irrigation pumps, harvesters, and other farm equipment. Most also use some form of natural or man-made fertilizer to enrich the soil.

One of the first lessons every economist learns is that these agricultural resources, no matter how plentiful in some places, are scarce relative to what the global society would otherwise want. The permanent fact of scarcity (the condition of being in limited supply) requires choices and creates costs. In the context of the world food supply, this means that no country has an unlimited supply of land, water, energy, and fertilizer. The more we explore technical ways with the potential to boost food production, the more we run into these natural and manmade limits. The limits need not lead to crisis; if they are ignored in assessing strategic options, however, threats may well develop that would put American soldiers at risk.

The Good News.

We all know that potential threats sometimes never materialize. In fact, Malthusian forecasts about population growth outstripping the food supply have been proven factually wrong, at least until recently. For one thing, Malthus ignored, or at least did not foresee, the tremendous increase in arable land in newly discovered and exploited areas of the world. In addition, Malthus did not anticipate the rising productivity per acre that resulted from the Industrial Revolution.

Similarly, if we move to the latter half of the 20th century, we also find that doomsday conditions have not occurred on a global basis. In fact, global agriculture, in an aggregate sense, enjoyed substantial success from 1961 to 1994; during that period the world experienced a steady growth in the production of most food crops. In the past 30 years, global food output has risen faster than population.¹² In an aggregate sense at least, the world food supply has been growing over the long term.

We all need to thank Norman Borlaug, whose research led to what is commonly called the Green Revolution, for the steady rise in production. His ingenuity and innovation combined modern, higher yielding seed varieties of rice, wheat, and maize with intensive and innovative use of inputs such as fertilizers, irrigation, and pesticides. Most of the recent growth in food production in developing countries is a result of the higher yields stimulated by Borlaug's research.

For many years, the Green Revolution allayed fears that the world could not increase food production at rates that matched population growth. The results speak for themselves. Agricultural experts were amazed at the impressive growth rates in the global yields of wheat, rice, and maize.¹³ And countries such as China, which adopted Green Revolution methods of farming in their entirety, showed astounding yield increases. Even countries that adopted only parts of Borlaug's methods have shown substantial increases in yields.

The Green Revolution protected the environment by enabling farmers to grow much more food without a dramatic increase in the area of cropland. Dennis Avery, a former agricultural analyst at the U.S. State Department calculates that ten million square miles, the equivalent to the whole of North and Central America, would have been cleared for farming had the new procedures and technologies not appeared some 35 years ago.¹⁴

The Bad News.

The success of global agriculture in the aggregate has not been shared equally by all countries. Africa and parts of South Asia continue to experience chronic malnutrition and periodic famines. This situation is particularly ironic because most African countries were self-sufficient in food at the time they became independent nations. Africa still has the potential to be a productive continent; its farmers are inventive and adaptive, and the continent has a third fewer people per acre than the developing world as a whole. Unfortunately, it is not living up to its potential; Africa presently is the continent most seriously affected by food shortages. Fifteen countries in the region are facing food emergencies. Of the 27 countries with household food security problems, 22 are in Sub-Saharan Africa.¹⁵ Estimates of the number of Africans at risk range from five to 20 million. Consequently, many Africans and South Asians are now heavily dependent on imported food for their survival.

The immediate cause of the 1992 famine in Somalia was drought. But the deeper causes of Africa's declining ability to feed itself are more complex, an unfortunate interplay of natural and human conditions. Certainly lack of rainfall and persistent civil strife contribute to recurring food gaps. But most experts agree that the basic problem is that African governments neglect investment in agriculture. Instead of empowering the countryside, those governments tend to have an anti-rural bias and an obsession with rapid industrialization. They also spend, on average, four times as much on armaments as they do on agriculture. Ethiopia, for example, continually asks the rest of the world for food, yet as much as 43 percent of its national budget has been spent on its military establishment.¹⁶

In addition, Africa's rapid population growth and counterproductive public policies also contribute to food gaps. Despite the fact that total food production has more than doubled in Africa and parts of South Asia since 1961, the rise in food production has not been enough to keep up with population growth there, which tends to confirm part of Malthus's theory.¹⁷ But Africa's problems are largely the result of self-inflicted wounds rather than the world approaching some natural limit to food production, a distinction that Malthus did not make.

That is a difference without distinction, however, for the African who is hungry and malnourished. For whatever reason, many developing countries in Africa and South Asia simply don't have enough food at hand to feed their people. Sometimes this is attributable to a lack of foreign exchange to import enough food at market prices to overcome the food shortfall. At other times, food is available to meet economic demand, but the social demand for food is not met because large numbers of the poor lack the money to purchase food on a commercial basis.

The considerations that follow--call them causes or effects--influence one's perceptions of the availability of food in the world. Some, such as specific water resources or humanitarian interventions, tend to affect the food supply of a single state or region. Others, such as the amount of arable land in cultivation, improvements in fertilizer, or the introduction of hybrid species, can affect the supply of food in a region or the entire world. The list is not exhaustive, but it contains sufficient information to provide a sense of the complexity of the food supply system. Taken together, these considerations can encourage measured responses to both optimistic and pessimistic strategic estimates of the influence of food supplies on national security issues.

Interventions.

Interventions into the food supply can be classified as humanitarian and governmental. The paradox is that both, while necessary, tend to destabilize the food supply system in a country.

Humanitarian.

Foreign aid packages that seek to prevent famine or offset chronic food shortages have become increasingly familiar in recent years. Global redistribution of food in 1993 by various agencies and organizations was impressive in real terms; a record 17 million metric tons of food was delivered to the chronically needy that year. Unfortunately, this figure still fell far short of the total food aid needs of that group.¹⁸ The International Food Policy Research Institute (IFPRI) estimates a remaining shortfall of seven to ten million metric tons in the per capita global caloric intake to meet recommended minimum levels among the chronically hungry.¹⁹

Unfortunately, such interventions are often a mixed blessing for the recipients of the food. While these massive giveaways undeniably provide temporary relief, foreign food aid actually hurts the recipients in the long run. When the United States provides food at no cost to developing countries, the relative price of food versus other commodities is altered. Signals to potential investors in agriculture in these countries are discouraging rather than encouraging. This, in turn, undermines long-run self sufficiency in food production. In short, food aid treats symptoms, not causes of food gaps.

Government.

A similar market distortion occurs when governments in developing countries set food prices at low levels. The policy is politically attractive, since it provides cheap food for growing urban populations. But farmers in the developing countries soon discover that the commodity prices paid by the government are often so low that they do not cover production costs. A low-price policy diminishes the incentives to actual and potential farmers to increase the food supply. The farmers, in turn, react by reducing the amount of food they produce. The resulting downward spiral often ends as a food shortage, triggering a vicious cycle that produces a need for more external food aid.

Poor countries need to permit returns on agriculture sufficient to raise rural incomes, even for the landless; they also should seek ways to spur economic development throughout their economies. In this sense, the food shortage is at least partially about poverty. And the poverty of farmers should be addressed by policy changes to restrict government interference in the agricultural marketplace altogether. None of these prescriptions will be applied without strife, however. When Jordan recently tried to free its wheat markets, city dwellers rioted.²⁰ Governments should be challenged to shift their focus to the poor rural producer, rather than continue to pander to the urban dweller.

This does not mean governments should stay on the sidelines. They can, and should, look for measures that tend to create an attractive infrastructure, one that enables private agriculture to expand to meet market pressure for increased consumables. One way to reach this objective is to spend less money on guns and more money on butter--investing in rural infrastructure, including bus and truck transportation and improved water and irrigation systems.

But what can international food agencies do about people who have no money whatsoever? Those agencies are relatively well equipped to deal with extraordinary, nonrecurring events, such as the drought that triggered the famine in Somalia. But they lack the resources to meet completely the chronic needs of the malnourished millions in Africa and South Asia. Comprehensive macroeconomic strategies in the affected countries, rather than short-term, stop-gap policies, are required to deal with chronic underproduction of food. Governments in poor countries must work with the IMF and the World Bank to create market-friendly economic development strategies that will systematically reduce poverty.²¹

Change--cultural, social, political, and economic--sufficient to create permanent improvements in the lot of the chronically poor will not occur quickly or easily. The long-term goal of these countries should be to provide steady purchasing power to previously poor people to allow them to buy food commercially. Seen from this perspective, chronic hunger and malnutrition have more to do with poverty than with reaching full capacity in food output.

The Grain Slowdown.

But are the poverty and hunger we see in Africa and in parts of South Asia really self-contained? Is this grim situation occurring in a world full of food? Not exactly. Even in the aggregate, things are not altogether rosy for global agriculture, at least in terms of output. For although world food production continued for several decades to grow faster than population, population growth is beginning to catch up, because the rate of growth in world food production is declining. From 1961 to 1992, growth in world agricultural production decelerated, dropping from three percent annually in the 1960s to 2.3 percent per year in the 1970s and two percent during the 1980-92 period.²²

Given these declining growth rates, can the capacity of the world agricultural system continue to feed a world population increasing by about 90 million people each year? Perhaps; consider, however, the state of ocean-produced food. Maritime experts agree that almost everywhere fish stocks have been plundered to the point of exhaustion. Some would ask, having reached a natural limit on food from the sea, whether a natural limit on grain can be far behind.²³

Higher Yields.

To a certain extent, Green Revolution methods can continue to make farmland more productive. That's because there is still considerable untapped potential for its methods and technologies around the world. For instance, the technologies of the Green Revolution failed to penetrate much of sub-Saharan Africa. Peter Hazell of IFPRI points out that India successfully feeds twice as many people as Africa on 13 percent of the land area of that continent. Another source suggests that at least part of the reason for Africa's inability to feed its people is that fertilizer use in Africa is only one fifteenth that of Chinese levels.²⁴

Similarly, innovative and intensive use of irrigation has helped to produce stunning results. The Food and Agricultural Organization (FAO) is cautiously optimistic that yield increases will continue. This is because of the existing wide disparities in yields among the best performing countries (using intensive Green Revolution irrigation methods) and those countries using less innovative irrigation practices. For example, rice yields on irrigated land vary from one to ten metric tons per hectare; today's average yield of 3.7 metric tons per hectare is well below the 6.7 metric tons per hectare achieved by the best performing countries.²⁵ And average yields of wheat and maize on some irrigated land are only about half the yields achieved, again, by the best performing countries.²⁶ Thus, FAO argues that there is considerable room for improvement by farmers currently achieving less-than-peak yields.²⁷

In Asia average crop yields are a mere 40 percent of the yields achieved by scientists using the best technology now available. In Andhra Pradesh, India, for example, scientists have boosted yields almost sixfold by planting a double crop of sorghum and chickpea instead of the single cropping method used by local farmers. Thus, if farmers in the tropics have enough water, fertilizer, and other essential resources, they can grow two or three crops a year on the same land, instead of one crop, with much higher yields to show for their informed and intensive use of the same amount of acreage.²⁸

Expanding Arable Land.

Over the past three decades the expansion of cropland area has been significant in two regions: sub-Saharan Africa and Latin America. In fact, sub-Saharan Africa stands as the only region in the world where expansion of arable land contributed nearly as much as yield increases to the growth of cereal production during the 1961-1990 period. In Latin America during the same period, expansion of arable land accounted for nearly one third of recorded production gains.²⁹

At first glance, there would appear to be potential for developing new cropland. Despite a strong trend toward urbanization in developing countries, there remain relatively large areas of sub-Saharan Africa and Latin America that are potentially suitable for farming. In each of these areas, FAO estimates that expansion of

arable land will contribute about 30 percent to the increase in crop production.³⁰ One World Bank estimate suggests that the world's farm acreage could increase by ten percent over the next 40 years.³¹

On closer examination, however, things look less promising, because most of the good arable land is either fallow or already in use. The land remaining in Latin America and sub-Saharan Africa is not prime land; much of it has tropical soil and a climate not conducive to farming.³² So yields from such land would tend to be low. This fact is well known, and it is difficult to get farmers to settle and develop these areas voluntarily. Financial incentives alone are not sufficient to induce settlement, because these lands are mostly in remote areas, far from markets and transportation. Expensive infrastructure would be needed before the lands could support commercial farming. In short, it would be difficult, costly, and time-consuming to develop new land for farming in the very areas where others have identified opportunities to do so.

Irrigation.

A number of conditions set clear limits on how many of the four primary agricultural resources can be harnessed to produce higher yields around the world. Since rainfall is distributed unevenly over the earth's surface, some farmers are dependent on irrigation water, if it is available, because local rainfall is too light or uncertain to raise crops to maturity. But the supply of irrigation water is limited; farmers in some countries use nearly all the available supply, creating tension with the rest of society and frequently with neighboring countries as well.³³

Environmental factors also set limits on higher yields, causing international agriculture strategists to be concerned about features of the agricultural system that Malthus never dreamed of. Global warming, for example, purportedly threatens to desolate at least some productive arable land. Optimists counter with the idea that a measure of global warming could serve to transform some of the barren tundra into new arable land, thus offsetting losses elsewhere.

An environmental backlash appears to be developing against some of the Green Revolution policies encouraged during the 1960s and 1970s: notable among them are technological solutions to the food supply problem, such as irrigation, and the use of farm chemicals and new high-yielding seed varieties. Consequently, the rate at which cropland is brought under irrigation is declining. FAO now predicts that irrigated land in developing countries (excluding China) will expand at a rate of only 0.8 percent annually, which is much slower than the 2.2 percent annual increase in during the 1970s and the 1.9 percent annual increase in the 1980s.³⁴

This decline is mainly due to the increasing cost of irrigation, both development and maintenance, and the growing competition for water uses cited above. Irrigation's environmental and health effects also inhibit further expansion. For instance, millions of hectares of irrigated land, especially in Asia, have become waterlogged or have been rendered infertile because the water has left deposits of salt. Salinization problems from improper irrigation techniques reduce crop yields and constrain future production.³⁵

Fertilizer.

The fertilizer situation is not very promising either. Nitrogen fertilizers used for agriculture are currently made from natural gas. But the supplies of petroleum and natural gas are strictly limited. And while increased use of fertilizer can help farmers produce more food, it can also cause environmental problems. Nitrogen fertilizers sometimes create a buildup of nitrogen compounds in the soil. Chemical fertilizers that run into rivers and lakes cause ugly, slimy blooms of algae.

Water pollution has caused the European Commission of the EU to target their farmers: "If you pour fertilizer into the Thames, the Seine, or the Rhine, you are likely to affect fisheries in the North Sea," explains one EU official.³⁶ The EU is expected to act early in 1997 to require all water users to pay the full "economic cost" of water in a drive to eliminate serious water pollution and waste. EU environmental officials have completed a framework directive that could severely affect farmers, who pay very little for their water in most EU states.

The draft directive defines the full economic cost of water as including a charge for environmental costs as well as operational and management costs, capital costs, and reserves for future investments. The proposal is almost certain to spark a fierce counterattack from farmers affected by the changes.³⁷

Higher Costs.

Although energy and fertilizer can make farmland more productive, increasing costs of energy and fertilizer also drive producer costs higher. Food prices rise in due course, eventually out of the reach of millions of people throughout the world who cannot afford to buy all the food they need even at lower prices.³⁸ Ways and means should be sought to expand food production at a cost that most farmers and consumers in developing countries can afford.

And even if a farmer can afford to use more expensive fertilizer and irrigation methods, he soon discovers trade-offs between the costs of these inputs and higher yields he can expect from them. In other words, greater use of these resources makes land more productive, but only up to a point. For instance, most farmers in the United States use seven to ten times as much fertilizer on each unit of land as do farmers in developing countries.³⁹ But U.S. grain yields are only about twice as large as those in developing countries. U.S. agribusinesses might be able to afford this kind of expense, but marginal farmers in many developing countries simply cannot afford the additional resources that the Green Revolution requires.

Ecological Degradation.

Expansion of arable land can have other harmful consequences. At least 45 percent of potential cropland in sub-Saharan Africa and Latin America, for instance, is under forest or is in protected areas.⁴⁰ In many cases, conversion to arable land would destroy the forests and cause the loss of biodiversity, which in turn could hinder medical research.

The increasing need for food already has caused the deforestation of significant amounts of marginal land. In the short run, the new land sometimes increases yields of specific crops. Over time, however, some of this new cropland is not sustainable, and the total amount of arable land can actually shrink. In many regions, trees that have created a barrier to the encroachment of the desert have been burned for fuel, thus causing the fragile topsoil essential to farming to be blown away by desert winds.

Subsequently, the scarcity of wood which accompanies deforestation can require farmers to use animal dung for fuel, diverting some of it from its traditional use as fertilizer. Fallow periods frequently have been shortened, resulting in overplanting and overgrazing; soil abused in this manner eventually wears out. Finally, deforestation and land overuse have reduced the capacity of the land to absorb moisture, thus diminishing its productivity and its ability to resist drought. Experience in mitigating ecological degradation has not been encouraging.

Diminishing Returns.

Because so much of the Green Revolution success story has been due to increases in yield, a key question for the future, given the obstacles cited above, is whether such increases in food production will continue, and if they do, at what rates. Unfortunately, there are already strong indications that the Green Revolution is beginning to run out of steam.

Although total yields have increased, yields of the three cereals in developing countries--rice, wheat, and maize--have recently been rising at a slower rate than in the 1960s and 1970s.⁴¹ It may be that the existing technologies of the Green Revolution will allow food supply to continue to grow only for so long. Thus, traditional technological improvements, while essential to any comprehensive food production strategy, can go only part of the way to feeding the world.⁴²

OTHER OPTIONS TO INCREASE SUPPLY

Given that cropland expansion can probably only do a small part to boost grain production, and that squeezing more yield out of existing cropland cannot do all of the rest by itself, we need to explore other ways to boost grain production to feed eight billion people in the next century. One way we can increase grain output is by applying better farming techniques. For instance, optimizing the timing and density of planting and seeding has raised corn yields by as much as 2.5 metric tons per hectare and soybean yields by one additional metric ton per hectare.⁴³ Some other ways to improve at the margin include:

- Governments in Africa could encourage low-technology, small-scale agriculture. Idriss Jazairy, a former high-level UN agriculture specialist, argues that the key to Africa's food future is the very small farmer so long ignored by African governments and outside donors:

The failure of past development strategies is that they have been based on a trickle down, social-safety net approach that emphasizes the consumption needs of the poor and identifies the poor as a burden on the growth process. Instead, we need to focus on their producing possibilities. We need to see that development is something that happens because of the poor, not in spite of the poor.⁴⁴

- Women in Africa may also be a key to Africa's food future. In the past, too many regional governments have treated women as second-class citizens. Despite the fact that 85 percent of rural women in Africa produce 80 percent of Africa's food, less than ten percent of them own land or resources because of laws that discriminate against them. If African governments did more to empower women farmers with such things as land tenure, it is likely that they would make the long-term investments (e.g., planting more hedges and trees that are needed to arrest soil erosion).⁴⁵
- Yields can be improved substantially by reducing post-harvest losses. The developing world generally lacks required facilities for crop storage; thus, even when crops are good, it is difficult to accumulate a surplus for the lean years. A large percentage of domestic farm output in some parts of Africa is lost to rats, insects, and spoilage; in Kenya, for example, about 24 percent of the harvested grains are damaged by molds, fungi, insects, rodents, and other pests. Estimates of total global marketing and distribution losses vary between eight percent and 25 percent of the harvest.⁴⁶ Significant gains can be obtained through better processing and improved storage and distribution facilities.
- Research scientists are now working to develop varieties of grain that not only produce higher yields but also have other improved characteristics. Such a grain might supply a more complete combination of amino acids, make more efficient use of water and fertilizer, and provide better resistance to insects and disease. The problem is that it is extremely difficult to develop a plant variety that has so many different characteristics. The necessary research therefore takes much time and money.
- Significant increases in supply may be possible through new developments using conventional plant breeding techniques. And at least with rice, a dramatic leap forward is already in sight. Researchers at the International Rice Research Institute (IRRI) in the Philippines have recently bred a new strain which invests about 50 percent of its energy in growing its ear, which contains the edible bits, compared with 30 percent in older varieties. It lifts yields 20-25 percent above the highest yielding varieties now available in Asia.⁴⁷
- These opportunities pale in comparison to the seeming potential in biotechnical research. As the following discussion shows, however, progress in this area is not without its problems.

Biotechnology has been helpful in developing increased pest resistance in some crops and drought resistance in others. In some cases, it is speeding up the process of plant breeding and lowering the cost of achieving such research goals as greater insect and disease resistance.⁴⁸ These successes have led some agricultural experts to argue that biotechnology has the potential to create another Green Revolution. But it would be wrong to suggest that a cornucopia awaits; so far at least, biotechnology has not led to a single dramatic gain in yield of any grains.⁴⁹ The most likely reason is that research and development in the best known form of biotechnology, genetic engineering, is concentrated in medicine, not farming.⁵⁰ Even where

agricultural biotechnical research is taking place, most of it is being done by private firms in the West, who tinker with the qualities of fruits and vegetables for rich markets, rather than trying to boost the quantity of basic grains for the poor.⁵¹

Unfortunately, the prospects for farm research in biotechnology no longer appear promising. After steady growth in the 1960s, aid fatigue has set in; IRRI is now laying off a third of its 1500 employees following budget cuts. If governments from rich countries continue to slash their own budgets for farm research, grain prices will have to rise to improve incentives for bioengineers to switch from medical work to agricultural research.⁵² In addition, many environmentalists have joined forces with budget cutters and are now campaigning furiously against agricultural biotechnology. For instance, consumer groups and retailers in several EU countries have protested against the introduction of a genetically modified soybean developed in the United States. Soya is used in 60 per cent of processed foods, and there is concern that consumers will have no choice about whether to eat the modified version. The soybean has been approved by the EU as safe; the protests derive from the fact that the U.S. product is neither labeled nor segregated from other stocks.

In this regard, three naked women enlivened the November 1996 World Food Summit in Rome, brandishing signs at the U.S. Secretary of Agriculture demanding that the summit “Ban the Gene Bean,” a reference to the controversial practice of genetically modifying soybeans.⁵³ While it might be easy enough to classify the protesters and their organizations as extremists with fanciful dreams of influencing policy, the following example indicates they are closer to the mainstream than their attire would suggest.

On 5 December 1996 Britain warned the United States not to try to force genetically modified maize onto the European market while concerns remained about its safety for human and animal health. In a stinging public demarche to Washington, John Gummer, the UK Environment Secretary, said in a BBC radio interview: “It is true that the Americans are trying to force this onto Europe without us making our own minds up about it. One of the important reasons for the EU is that we are strong enough to say to the Americans that we decide what we want in our food chain and not you.”⁵⁴ The tough UK stance occurred during heightened consumer concern about food safety in Europe following the “mad cow” crisis in 1995 and 1996. The European Union banned exports of British beef after scientists discovered a link between “mad cow disease” and a new variant of Creutzfeldt-Jakob disease, a fatal human brain illness.⁵⁵

Senior U.S. trade and agriculture officials have written to the European Commission expressing dissatisfaction at EU delays in opening the market for modified maize and for rice. The U.S. stake in the outcome is substantial; the EU, mainly Spain and Portugal, imported about \$500 million of U.S. maize in 1995. While only about 0.6 percent of this season’s U.S. maize crop consists of the modified variety, EU officials have warned that all U.S. maize could be blocked if it cannot be segregated. The dispute threatens to create a trade row if it is not resolved soon.

CHINA’S DISAPPEARING ACT

As the largest potential source of new demand for grains, China will continue to attract considerable attention in discussions of food production. Prospects for developing more farmland in China are discouraging, a significant change from the height of the Green Revolution, when China’s rising production of grain was nothing short of phenomenal. China now has an estimated 125 million hectares of cropland, but the total has been shrinking for some time and is likely to continue to decline as China industrializes.⁵⁶ Consequently, a rising appetite for grain-intensive meat in the diet of prosperous Chinese, and no substantial additions to arable land, will cause China to become a large importer of grain. How large an importer is a subject of contentious debate among international agriculture experts.

In 1995, Lester Brown, the world’s leading modern Malthusian and President of the Worldwatch Institute, said that China will lose roughly half its grainland by 2030, as roads, factories, and golf courses spread across the countryside. If he is right, China’s imports of grain would overwhelm world food markets and lead

to skyrocketing grain prices.⁵⁷ He shocked grain dealers with a forecast that China would import 216 million tons by 2030.⁵⁸ While all the experts agree that China will be a major grain importer in the future, few are as pessimistic as he; most think the loss of land and the size of Chinese grain imports will be significantly less than what Brown predicts.

New research by a team of U.S. and Chinese economists at the Organization for Economic Cooperation and Development (OECD) reports that Chinese grain imports will stabilize at levels much lower than predicted. The authors of the study have developed projections which run counter to Brown's earlier predictions.⁵⁹ Their OECD report says China will become a significant importer but "will not empty" world grain markets. Under the baseline scenario in their research, grain output is expected to reach 410 million metric tons by 2000, well below Chinese official projections of 455 million metric tons. OECD says China's grain imports are likely to jump to around 40 million metric tons annually by 2000 from just three million metric tons at the start of the 1990s, but will stabilize at around 43 million metric tons from 2010.

The OECD study agrees with Brown that higher imports will reflect rising demand for feed grain and meat, as well as a slowdown in supply due to reduced investment in agricultural research during the late 1980s. But the study disagrees with Brown when it argues that China itself might limit grain imports, especially if these began to affect world prices severely. Not only would that be an incentive to raise domestic production, but there might be foreign exchange constraints on large grain imports. Poor port and transport infrastructure could also impede imports, while China's leaders have long been constrained by a desire for self-sufficiency.⁶⁰

Assuming that the OECD study on China reflects a reasonable scenario based on defensible assumptions, the amount of disappearing cropland in China means that a global expansion of farmland can play only a small part in boosting world food supplies. That being the case, a much greater part will have to come from squeezing more from existing land. In essence, that's what the Green Revolution did.

THE IMMEDIATE FUTURE

Pessimists claim that the gradual slowdown in productivity gains has led to a genuine crisis in the world food supply. They claim that recent data finally provide conclusive indicators that the world is running out of food, and at first glance they appear to be right. The food supply was squeezed during 1994 and 1995; for instance, there's no denying that food prices rose and food stocks fell during this period. Between June 1993 and May 1996, food prices rose by 47 percent after many years of decline.⁶¹ In particular, corn-futures prices rose 57 percent from the start of 1996 to a record-setting \$5.48 a bushel by July. Wheat-futures prices also jumped to an all-time high of about \$7 a bushel over the same period, effectively double the price that had been stable since early 1995.⁶² The higher prices did severe damage to many African nations, which are net importers of food. According to the UN Food and Agriculture Organization (FAO), higher prices in 1995 alone increased the cost to developing countries of cereal imports by about \$4 billion.⁶³

Between June 1993 and May 1996 the world's grain stocks fell to 13 percent of annual consumption, the lowest level ever recorded.⁶⁴ Even in the United States, "the breadbasket of the world," U.S. granaries in early 1996 held a precariously low amount of grain—just 426 million bushels of corn at one point in September, the lowest level since the 1970s.⁶⁵

Should one conclude that the whole world, as opposed to Africa and South Asia, is in fact running out of food? Perhaps there's another explanation. At the World Food Summit, elder statesmen were curiously relaxed in contrast to the alarm shown by many summiteers. The elders seemed satisfied that complacency about food security had been shaken, but perhaps they were thinking that they had seen the picture before. These sober and dispassionate individuals from such places as the World Bank may have remembered a similar conference in Rome a quarter century earlier. Then, as now, the mood was equally alarmist. Then, as now, the world was running out of food, or so it seemed. The pessimists at the 1974 conference predicted dire consequences, even mass famine, which proved wildly wrong.

Admittedly, the market signals in 1994 and 1995 did show some kind of shortage, but not all shortages are the same. A close examination of data from this period reveals no structural shortage that one would anticipate if the world food supply had in fact reached full production capacity. Instead, unusual circumstances of a short-term and reversible nature account for the rising prices and de-stocking of grains. Three factors--the weather, the fall of the Soviet Union, and the withdrawal of land from production--are particularly atypical of a systemic crisis in food production.

The high prices reflected a record low crop production due to unfavorable weather. Conditions for wheat stayed dry through May 1996, while weather for corn and soybeans remained dry in key producing regions into June 1996. Second, food production in the former Soviet Union fell dramatically because subsidies had been withdrawn from inefficient state farms. Compared with a peak production year in 1989, production in 1994 was down fully 40 percent.⁶⁶ That trend should reverse itself as economic reforms take hold in Russia and the Ukraine. And third, the fall in grain stocks reflects policy changes in the United States and Western Europe to rein in the huge overproduction of grain that had occurred in the 1980s. After their grain surpluses had reached embarrassingly high levels, the governments in Washington and Brussels (the EU) began paying grain farmers handsomely to let some of their land lie fallow. Over the past ten years, for example, U.S. farmers took about 37 million acres of cropland out of cultivation.⁶⁷

But not long after concerns about grain supply pushed grain prices to record-breaking levels, grain prices dropped. Corn-futures prices fell about 50 percent per bushel between July and December 1996, from \$5.48 to the year's low of \$2.60. Similarly, wheat-futures prices fell abruptly during the same period, from \$7 a bushel in July to below \$4 a bushel by December.⁶⁸

Why the nose-dive in grain prices? The two main reasons were the better-than-expected weather and a significant surge in worldwide grain supply. Timely summer rains and warm temperatures late in the 1996 growing season boosted the 1996 U.S. corn and soybean crops to near-record levels. Second, farmers responded to higher prices by bringing land back into production; U.S. farmers added eight million acres of corn in 1996, and large crops came from Europe, Australia, and South America. In short, markets are adjusting to the weather and to various policy decisions, just as Adam Smith, the English free-market economist, would have expected.⁶⁹

Grain prices in 1997 are likely to range well below the unusually high prices of the first half of 1996; commodity analysts on Wall Street estimate that wheat will average about \$4 a bushel and corn about \$2.60. Several factors will add to the further growth in grain supplies. Moist growing conditions in South America will lead to record crops there, and freedom-to-farm legislation--passed in the United States in 1996, and gaining momentum worldwide--will allow farmers to build up grain supplies when market conditions warrant. Finally, genetically enhanced crops could increase yields as that form of biotechnology gradually becomes more acceptable.⁷⁰

CONCLUSIONS

Even if a world food crisis is not imminent, we should ask ourselves whether trends have indeed invalidated Malthus's thesis, or whether they have merely transformed or deferred it. One thing is certain. Given that the population in 2035 could be about twice what it is today, there will have to be a lot more grain available to meet the demand.

Most of the ways to grow more grain result from greater farm output, which can be increased either by developing new farmland or by making existing farmland more productive. The world food supply also benefits from reducing the demand for feed grain (e.g., reducing population growth) and by developing new sources of food. At the same time, there are many seemingly marginal changes in how the world manages farming that could substantially affect chronic regional shortages. Efforts to make better use of existing cropland, to reverse deforestation, to vest women with rights they now lack in some agricultural communities,

to modify traditional farming practices, to reduce losses of each harvest to pests and decay--each and all could increase the amount of grain that is available each season for consumption by humans and animals.

Profound systemic change, such as was prompted by the principles of the Green Revolution, is more problematic. Biotechnology, once the hope of many agricultural specialists, may never rival the Green Revolution's legacy, but it is also probably too soon to write it off. Unanticipated breakthroughs, new theories, proof that genetically altered foodstuffs do no harm to humans when consumed directly or through animal protein--all have the potential to stimulate quantum shifts in the global supply of food. Yet we've seen enough constraints to question anyone's forecast of a food cornucopia.

In the near term, strategists need to avoid the twin pitfalls of complacency about a world full of food and doomsday alarms about a global food crisis. What is needed from world leaders is an unprecedented level of cooperation in the formulation of a long-term international food strategy. One consequence of failure could be resource-driven conflicts that might have been avoided had policymakers understood the nature and extent of the world food supply problem and taken appropriate steps to deal with it.

What is needed to avert that outcome is a comprehensive strategy that synthesizes diverse approaches to improving the growth, harvesting, storing, and distribution of the annual crop of grains, while prioritizing resources for the most promising areas of improvement. Thus, biotechnology, the sensible expansion of cropland, the responsible extension of the Green Revolution technology in neglected arable land, continued basic research into plant genetics, and smarter public policies all are important in this holistic approach. Curbing population growth and other demand reduction programs are also essential parts of any plan to stabilize the world food supply for the long term. None of these objectives will be easy to define or carry out; they all have the potential to affect profoundly the values, cultures, societies, and beliefs of the affected peoples.

When Norman Borlaug received the Nobel Prize in 1970 for his research leading to the Green Revolution, he warned that the new methods would provide only a limited respite, 30 years at most, in which governments could develop and carry out supply and demand policies for dealing with the world food supply challenge.⁷¹ As we approach the end of Borlaug's window of opportunity, the world is still groping for that strategy. Until we develop one, there will continue to be those who yearn for simple solutions to the complex problems of world food supply and demand.

The real danger is to relegate the world food supply to the backwater of strategic studies. Strategists need to understand that the world food supply is a global challenge that bears most heavily on the peace and prosperity of the international system. World leaders have an unprecedented opportunity to move this global issue to the top of their agendas. If they fail, their successors may have to deal with the problem "when it comes to visit" as a major and enduring crisis in the near future.

ENDNOTES

- 1 For a relatively optimistic view of the world food supply, see Tim Dyson, "Be Wary of the Gloom," downloaded from *People and the Planet* home page, the Internet, 24 November 1996 (<http://www.oneworld.org/patp/index.html>); also see Tim Dyson's upcoming book, *Population and Food: Global Trends and Prospects*, to be published early in 1997.
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- 20 *The Economist*, p. 18.
- 21 A market friendly economic development strategy includes a stable macroeconomy, a competitive microeconomy, investment in people, and global linkages. For a concise discussion of this concept, see The World Bank, *World Development Report 1991: The Challenge of Development* (Washington: Oxford Univ. Press, 1991), pp. 6-9.
- 22 Nikos Alexandratos, ed., *World Agriculture Towards 2010, An FAO Study* (Chichester, UK: John Wiley and Sons; and Rome: Food and Agriculture Organization of the United Nations, 1995), pp. 38-44.
- 23 See Lester R. Brown, "Overharvesting the Oceans," in his *Full House*, ch. 5.
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- 44 Moffett, *Global Population Growth*, p. 36.
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- 48 Brown, *Full House*, pp. 139-40.
- 49 *Ibid.*
- 50 *Economist*, p. 23.
- 51 *Ibid.*
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- 53 *Ibid.*
- 54 *Financial Times On-Line*, 5 December 1996.
- 55 The origin of consumer concern cited here can be traced back to a British government announcement that there appeared to be a link between “mad cow” disease, also known as bovine spongiform encephalopathy or BSE, and ten cases of a new variant of the Creutzfeldt-Jakob disease, a rare but devastating human disease that progressively and fatally destroys brain tissue. The announcement caused widespread panic among British consumers and prompted a temporary ban on British beef in Europe.
- 56 Alexandratos, p. 15.
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- 58 *Financial Times On-Line*, 27 November 1996. For a copy of this OECD study entitled *China in the 21st Century*, contact the Publications Service, OECD, 2 rue, André-Pascal, 75775 Paris Cedex 16.
- 59 *Ibid.*
- 60 All studies on the world food supply are based on important assumptions. In this case, the OECD authors (Justin Lin of the University of Beijing, Huang Jikun of the Chinese Academy of Agricultural Sciences, and Scott Rozelle of Stanford University) note that their forecast is subject to wide variations depending on population and income growth. With high income growth total grain demand would reach 647 million metric tons by 2020, compared with 594 million metric tons under the baseline scenario. Equally, with high investment in research and irrigation, China could lift output to 627 million metric tons against 552 million under the baseline scenario.
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- 62 *The Wall Street Journal*, 2 January 1997, p. R35.
- 63 *The Economist*, *op. cit.*
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- 65 *The Wall Street Journal*, *op. cit.*
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TOWARDS WATER SECURITY

• CHAPTER 8 •

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Geographical variables and their importance to international relations and political military affairs are easily ignored, even though two events of the 1970s drew the attention of policymakers to the issue of resource availability with an urgency unknown in peacetime. The first was the Arab oil embargo of 1973-74; the second was the 1978 invasion of Zaire's Shaba province by Angola-based guerrillas. The former quadrupled petroleum prices and reminded producers and consumers alike that the world economy depended on the highly concentrated deposits of this increasingly scarce fossil fuel. In the latter case, even the brief curtailment of cobalt shipments from Zaire caused prices to escalate from \$6 to over \$50 per pound on the spot market. Disruption of the cobalt market forced a wide-scale reevaluation of the concept of strategic resources. In the United States, the review included non-fuel minerals essential to U.S. industry, such as chrome, manganese, and platinum group metals, virtually 100 percent of which are imported. Analysts were reminded that, as with petroleum, world reserves of these minerals were not evenly distributed but were largely concentrated in politically unstable regions. Policymakers, in turn, acknowledged that the destabilizing imbalance of natural resource supply and demand can have profound consequences for U.S. security interests.

The vice president of the World Bank, Ismail Serageldin, captured the current wisdom on natural resource issues when he said, "Many of the wars of this century were about oil, but wars of the next century will be about water."¹ When President Jimmy Carter drew his line in the sand with the Carter Doctrine, he was simply formalizing what everyone knew: Middle Eastern oil was vital to the national security of the United States and its Western allies. Few would argue that petroleum was not a major underlying cause of the Gulf War, and currently Iran is putting pressure on Saudi Arabia to reduce its oil production in order to drive up world oil prices and help Iran pay for its \$10 billion arms buildup. The growing nuclear program of Iran, Israel's nuclear weapons program, and the interests of other Middle East states in nuclear weapons continue to show the potential for oil to lead the world to further conflict. However, in terms of its relative scarcity and the ability of economics and technology to mitigate the imbalance of its supply and demand, water poses different and potentially more difficult problems for strategists. Efforts to manipulate the global supply of petroleum have been a leading phenomenon of the final decades of the 20th century. Control of the sources of fresh water could be equally significant in the opening decades of the next.

The insufficiency of fresh water has in the past led to violent conflict, and is currently the source of international tensions, but one should not simply assume that population growth will inevitably lead to war over water. Technology, pricing, conservation, trade, and industrial and agricultural policy changes may mitigate water scarcity and alter the prescription for conflict. Research on environmental security issues generally accepts the multiple causes of conflict, but fresh water is undeniably an important variable. Given assumed population growth, changes in climatic conditions, and the imbalance of water resource supply and demand, it will continue as a source of tensions; it could become the determinant variable in future international conflict. This article examines the strategically important environmental security issue of water resource scarcity, imbalances in fresh water supply and demand, methods of mitigating water scarcity, conditions that are likely to signal when water resources may lead to conflict, and policy options that might help us to change that equation.

WATER SUPPLY

Petroleum is but the currently most popular energy alternative in a relatively crude stage of mankind's energy technology development. It remains cheap, widely available, and easily transported. Even if conventional oil reserves were to be contaminated by a nuclear exchange, or denied through war or political ideology, non-

conventional oil reserves locked in deposits such as the Alberta tar sands or global deposits of oil shale could be called upon, albeit at higher cost, to offset some of the disruption of conventional petroleum supplies. Moreover, the increase in oil prices resulting from loss of access to conventional oil would drive the industrial world to implement meaningful energy strategies, including research and development programs designed to develop the technology for the many alternative energy sources. The major per capita consumers of petroleum are the industrialized countries, which have the greatest potential to initiate the required technological and economic policies. Thus, pricing mechanisms, substitution, and technology make the implications of potential oil shortages less dramatic.

Water presents a considerably less-manageable problem. Most of the water on the earth, some 97 percent, is contained in the world's oceans and is therefore of little use for essential agriculture, drinking, or most industrial uses. Only three percent of the water on the earth is fresh and, of this, more than two percent is locked away in the polar ice caps, glaciers, or deep groundwater aquifers, and is therefore unavailable to satisfy the needs of man. Furthermore, only 0.36 percent of the world's water in rivers, lakes, and swamps is sufficiently accessible to be considered a renewable fresh water resource.² The supplies of useful fresh water are finite, and most of the forms in which it is used have no substitute. Our fresh water is made available through the hydrologic cycle in which solar radiation evaporates ocean water, which subsequently falls to land as rain and returns to the sea as runoff through rivers or aquifers. Precipitation, then, is the original source of all fresh water; it is highly variable in its geographical occurrence.

Precipitation in large sections of the world is inadequate to support substantial agriculture, populations, or industry. Migration, along with exponential population growth, have increased the number of people living in marginal, arid lands, where survival depends upon the availability of scarce water resources. At the same time, scientists have warned of coming changes to the earth's climate and increasing periods of unstable weather patterns and rainfall. It is not yet clear whether such variations result from industrialized society and the activities of man that may give rise to global warming, or are simply part of a long-term global climate cycle which man has yet to define. The El Nino phenomenon points out the vulnerability of civilization to such variations in the hydrologic cycle.³

The uneven global distribution of fresh water is striking. Most global rainfall occurs in the equatorial zone that stretches from South and Southeast Asia across Africa into Central America and the Amazon Basin. In general, rainfall decreases north and south of this zone. By itself, the Amazon River accounts for 20 percent of average global runoff, compared to all of Europe with only seven percent. The Zaire river basin accounts for 30 percent of Africa's total runoff.⁴ Areas chronically short of fresh water include parts of the western United States and northern Mexico; much of Africa, the Middle East, and central Asia; and small portions of South and Central America. Water-scarce countries should receive close examination, because of the rainfall variability within the borders of a given country.

- Take the case of the United States; in its eastern portion, water *quality* is the major concern, while the western portion focuses chiefly on water *quantity*. Overall, the United States appears to have sufficient water, but large portions of the plains and western mountain and inter-basin regions are arid and have overexploited aquifers. Rising populations in the water-scarce west are exceeding sustainable water yields and creating tensions with Mexico over the quality and quantity of water from the Colorado and Rio Grande rivers.
- Southeastern China benefits from seasonal monsoons and has sufficient water supplies, while the North China plain, a fertile area that accounts for 25 percent of the country's grain harvest, has water scarcity problems. Over-pumping aquifers to support wheat and millet cultivation has caused approximately one third of Beijing's wells to go dry, with the water table dropping between one and two meters annually. This condition is indicative of the water scarcity problems of this agriculturally and industrially important

region of the country. China's situation is particularly important since that country, with approximately one-quarter of the world's population, can claim only eight percent of its fresh water resources.⁵

- Unlike the case of other natural resources, it is sometimes difficult to declare that certain countries do or don't meet standards for water sufficiency. Nevertheless, World Bank statistics identify approximately 20 countries that have been declared chronically water scarce. The list includes Saudi Arabia, Israel, Jordan, Kuwait, Egypt, Kenya, Somalia, and Singapore.⁶ Other strategically significant countries with pronounced rainfall variability include Pakistan, Mexico, and India.

It is important to note that water scarcity from a lack of precipitation can be mitigated through desalinization and external annual river flows. Desalinization plants require substantial investments of energy, technology, and capital; as a result, most of the world's desalinization plants are located in the energy-rich Middle East. Desalinization is not a practical solution for most water-scarce regions. More important, from both historical and practical perspectives, are the countries that share access to major rivers. Syria, Egypt (the heart of the Roman Empire's granary), and Iraq, where the Tigris-Euphrates Valley gave birth to modern civilization, had dominating cultures throughout much of their history because of waters originating in upstream countries. Decisions by upstream countries to develop the heretofore common water resources, however, can have major implications for the economic viability and continued cultural existence of those downstream. Tensions currently exist within all these countries, and between them and their neighbors, as a result of upstream user decisions.

WATER DEMAND

Demand for fresh water is examined from the perspectives of population growth, urban growth, and global water use. The latter falls into three categories: irrigation, which accounts for some 73 percent of fresh water consumed; industrial uses, with 21 percent of consumption, and public uses at six percent.⁷ Water use patterns differ between industrialized and developing countries. In the former, industrial uses account for approximately 40 percent, while in the latter industries use no more than ten percent of annual fresh water consumption.⁸ Conversely, in the developing world, agriculture accounts for 90 percent of water use.

Populations.

So long as the supply of fresh water is provided by the hydrologic cycle, the demand for water is primarily dictated by the world's rising population. The earth's population approximates a J-curve and is growing faster than at any time in its history, with nearly 90 million people born each year. The current world population figure of 5.8 billion is too abstract for many people to grasp, but it can be put in context by these facts: at the beginning of the century there were only 1.6 billion people, and in 1950, the world population was only 2.5 billion.⁹ It required from the beginning of time until approximately 100 years ago for the world's population to reach 1.6 billion; today, less than a century later, the earth is home to an additional four billion. This exponential rate of increase is not predicted to taper off for some time. Developing world countries account for 95 percent of this population increase. It is difficult to see how the hydrologic cycle will keep pace with the demands of this exploding population.

Increased development, industrialization, and growing affluence expand the per capita demand for water, in part because increased wealth generates demand for animal protein, such as beef and chicken, which require greater quantities of grain to produce similar amounts of calories for human consumption. An increasing population requires increased irrigation and dams, and generates ever-increasing quantities of untreated pollutants, both of which can affect adversely the quality of water in a state or region. Thus, water passed to downstream users, even in water-rich regions, is often contaminated by toxic and hazardous wastes, pesticides, and fertilizer; its use may also be limited by increased salinity due to multiple iterations of

irrigation. Some recent statistics indicate that global demand for water for irrigation, household, and industrial use will increase faster than the rate of population growth.¹⁰

Population growth greatly increases the demands placed on governments struggling to maintain legitimacy in the eyes of their people. This is particularly important to those countries that are newly democratic or seeking to move toward democracy. The figure that best communicates population pressure is doubling time, the time in which the population of a country is expected to increase 100 percent. The United States is expected to double its population in 114 years, an estimate that allows for annual immigration of nearly one million people. The doubling time for the following strategically important countries is particularly noteworthy: Egypt, 31 years; India, 37 years; China, 66 years; Iraq, 19 years; Iran, 24 years; North Korea, 38 years; and Mexico, 32 years.¹¹

Urban Growth.

By the year 2000, fully 50 percent of the world's population is expected to be living in urban areas, where demand for fresh water even now cannot be met consistently. The new century will be characterized by increased urbanization, caused primarily by rural dwellers flocking to the cities to take advantage of presumed job opportunities. Because economic growth is the pulse taken almost daily to determine the health of a country and the ability of an administration to govern, governments tend to favor industrialization over water quality, despite the fact that water-borne health threats can often create long-term health problems. And the very countries in which most population growth will occur will be unable to fund both economic growth and adequate social infrastructure for the uncontrolled influx of people to the cities.

Water quality will become the most pressing problem in the world's major urban centers. In the Caribbean and Latin American regions of the Western Hemisphere, 70 percent of the population is urban, and 33 percent of that urban population is concentrated in 15 large cities of two million or more inhabitants. While immediate security threats are well known, such as Brazil's use of its army to control the barrios that encroach on the outskirts of Rio De Janeiro, health threats attributable to inadequate treatment of water may in time overshadow such coercive measures. Less than half the urban population in this region has access to sewer systems; approximately 40 percent of urban residents don't have proper sanitation facilities. Some 90 percent of the waste water generated in the large urban zones is discharged without any treatment at all. The emergence of cholera in Latin America, after a 100-year absence, should be considered less an aberration than an indicator of the potentially lethal combination of population growth and inadequate supplies of fresh water. Even in a relatively sophisticated technological environment like Moscow, health officials warn travelers to beware of hepatitis A, bacterial dysentery, and other gastrointestinal diseases from organic contamination in drinking water. Few experts are sanguine about the possibility of providing safe fresh water supplies to the growing wave of urbanites in many parts of the world.

In spite of concerted efforts by the UN and the World Health Organization, in 1990 some 1.2 billion people lacked a safe supply of water and 1.7 billion had inadequate sanitation. Given anticipated growth rates in urban areas and pressures on poorly performing governments, the situation is not likely to improve.¹² The availability of fresh water in certain parts of the globe is already a problem, one for which there appears to be no immediate solution.

Agriculture.

The amount of fresh water consumed in agriculture has gone up in the wake of the Green Revolution, which introduced high-yield strains of grain requiring massive increases of irrigation, fertilizer, and pesticides. Seventy percent of the increased grain production in populous Asia has been made possible by irrigation.¹³ Global irrigation acreage has increased in parallel with acceptance of the new grains. In 1950, worldwide

irrigated land totaled 94 million hectares, whereas in the second half of the century, land under irrigation has risen to 235 million hectares. Currently, 16 percent of the world's agricultural land is irrigated, and that 16 percent produces 33 percent of the global food supply.¹⁴

The rate of increase in irrigated land appears to be declining; there are many possible explanations for the downturn:

- Most of the easily developed land was chosen first; remaining irrigation projects seek to improve yields from land that is of marginal quality and expensive to develop.
- Donors and lending institutions are increasingly circumspect about loans for costly irrigation infrastructure, such as dams and canals, where the environmental costs are high and the economic return on investment is in question. In addition, many of the developing countries have substantial debt burdens that they currently cannot meet.
- Irrigation is an inefficient way to use fresh water. It is estimated that only 37 percent of water applied through irrigation is absorbed by the crops; the rest is lost through evaporation, seepage, or runoff. Runoff, in turn, typically is polluted with agricultural chemicals and salts; it is consequently of less economic value to others and may even pose health threats.
- Water to be used in irrigation schemes frequently is pumped from deep, non-renewable fossil aquifers, and many of the most important irrigation aquifers are drying up. In the United States, the well-known Ogallala fossil aquifer that runs under much of the fertile southern Great Plains is 50-percent depleted, and large areas of once-irrigated land in north Texas have been abandoned. Similar situations exist in northern China and in India. In Israel, the Arabian Gulf, and several U.S. coastal states, excessive pumping of ground water aquifers along the coast has led to the intrusion of sea water which is contaminating drinking water supplies.¹⁵
- Irrigation schemes are difficult to maintain. Dams fill up with silt, as do canals and channels, and the fertility of the soil is eroded by the buildup of salts. Several strategically important countries are struggling with their irrigation programs. China has been forced to remove 930,000 hectares of irrigated land from agricultural production in the last 15 years and is losing over 100,000 additional hectares each year. From 1971 to 1985, the former Soviet Union abandoned an astounding 2.9 million hectares of irrigated crop land. The high cost of maintaining existing irrigation systems will eventually absorb some of the funds required to start new irrigation schemes.¹⁶ A preliminary conclusion is that the increasing world population and the growing affluence of some nations will greatly influence the requirement for grain, and correspondingly power will shift to those countries with sufficient water to feed themselves and produce a grain surplus.

Industry.

Industrial activity cannot be developed, nor can it long survive where already established, without access to substantial quantities of fresh water. Industrial uses for water include boiling, cleaning, air conditioning, cooling, processing, transportation, and energy production. The industries requiring the most water for their processes are petroleum refining, food processing, metals, chemical processing, and pulp and paper. In the more sophisticated industrialized countries, such as the United States, Japan, and Germany, industrial leaders motivated by new environmental and anti-pollution laws have developed technologies that recycle water before discharge. In the United States, industrial water may be used more than twice before it is returned. Purifying water after its industrial use requires costly, sophisticated technology that is not widely available in the less-developed countries to which, paradoxically, industrial production is increasingly being shifted.¹⁷

Water is particularly important in the energy industry. Fossil fuel and nuclear power plants and hydroelectric systems all require substantial quantities of water. Particularly heavy uses of water in the production of energy are the oil shale and tar sands (synthetic fuels) industries, which must reclaim land, generate power, process the mineral, and dispose of waste. At the Athabasca concession in Canada, where tar sands are mined and boiled to recover petroleum, it requires eight tons of water to produce one ton of final product.¹⁸ Because the tar sands and oil shale tend to be found in arid regions, petroleum production in those regions could be constrained by the availability of water for industrial uses. A major problem of the industrial use of water is the fact that it creates toxic and hazardous pollutants that renders waste water unfit for subsequent human consumption or use in the agricultural sector; these conditions can also permanently pollute aquifers.

The expansion of industry to the developing world, in addition to local human contamination of fresh water supplies, is making it more difficult to maintain water quality in many parts of the world. Other factors, such as heightened economic interdependence and the rationalization of industrial production, have caused substantial migration of heavy industry to the developing world. Ready availability of raw materials, lower labor costs, and higher production costs in the developing countries—often caused by environmental regulations more stringent than found in many developing countries—have driven industries to more hospitable and less constrained locales. Health officials who previously had focused on relatively benign water pollutants such as coliform bacteria must now contend with nitrates, heavy metals, chemicals, and synthetic pollutants such as polychlorinated biphenyls (PCBs).

Many governments facing these new problems lack the technical skills, experience, manpower, and economic resources to correct them. Moreover, the subtle pressure to ignore water-related health threats from industries that promise even a partial solution to the government's economic problems is often not subtle at all. Governments caught in the bind between the promises of industrialization and the warnings of their own public health officials will have incentives to seek access to safe water even at the expense of their neighbors. Downstream countries increasingly will be concerned about pollutants discharged into waterways from upstream states. Trends in water quality and consumption are creating conditions in which conflict over access to fresh water is increasingly possible.

WATER AND CONFLICT

Water is an essential resource for which there are no substitutes. The fact that water does not lend itself to international trade complicates the water resource scarcity problem. Unlike metals, grain, timber, coal, or petroleum, water cannot be transported economically in large quantities, certainly not in the quantities necessary to satisfy the demands of even a small country. While there are schemes to divert major rivers, create long canals, tow icebergs, or desalinate water, such schemes have substantial economic and political costs. They appear to be sustainable solutions to water scarcity problems only in rare situations.¹⁹ The supply of fresh water is limited by the hydrologic cycle and general climatic conditions, and demand for water as an agricultural, industrial, or urban resource is increasing exponentially with the rising global population.

If conflict over this scarce resource is to be averted, steps must be taken to allow for fair and equitable resolutions of conflicts over it. Water law in the United States is well developed and backed by numerous precedents. In the eastern part of the United States, the legal allocation of water was historically based on riparian rights, wherein all people living along the river had a claim to river water, but were not allowed to divert the flow of water in any meaningful or permanent fashion. This solution worked reasonably well in an area where there was substantial water, before large-scale industrialization or irrigation schemes were developed. As the United States expanded westward, appropriations doctrine replaced riparian rights as the dominant principle of water law. Under appropriations doctrine, priority was given to the first user of the

water. This doctrine is better suited to areas where water supply is limited, and it played a major role in the allocation of Colorado River waters.

Other doctrines are applicable to international (cross-border) water flows. The Harmon Doctrine, implemented in 1909 as a result of a water dispute between the United States and Canada, said the upstream state (the United States) had an indisputable right to water. This finding caused bad feeling between the United States and Canada and did nothing to promote cooperation or more creative solutions to the problem. Subsequently, the principle of equitable apportionment was instituted and became the main principle of a U.S.-Canadian treaty. Equitable apportionment called for a sharing of power and water benefits equally, regardless of the upstream state (or country); this principle overruled the Harmon Doctrine.²⁰ Though not without margin for interpretation, U.S. water doctrine has substantial case precedents and offers a legally binding and enforceable remedy to conflict over scarce water resources.

Unfortunately, in the international milieu water law is not nearly as robust or useful in settling conflict. The method of determining sovereignty over international or transboundary rivers remains contentious throughout the international community. Most water law developed since 1800 has focused on freedom of navigation rather than water sovereignty. Difficulty in developing consensus on water law often turns on simple definitional issues. In addition, two competing doctrines of international water law have developed. The first is that of absolute state sovereignty, derived from the Harmon Doctrine, in which the upstream state has absolute sovereignty over its territory and the waters therein. The alternative doctrine is absolute integrity, which looks upon a river basin in a way that favors the downstream states by suggesting that the waters be apportioned in an equitable and reasonable fashion. Quite predictably then, when looking at the Tigris-Euphrates waters conflict, Turkey takes the position that it has absolute state sovereignty over the river waters because it is the upstream state, while Iraq and Syria champion the doctrine of absolute integrity, insisting on a reasonable and equitable apportionment of water from those rivers. Conspicuously absent, and a guarantee that international water law will remain ineffectual, is an enforcement mechanism. While an arbitrator or an international court may make a decision on a particular water dispute, that decision does not establish an enforceable precedent; enforcement depends on the good will of the parties involved. Most international water disputes are approached through bilateral or multilateral negotiations rather than legal precedents.²¹

History is replete with examples of violent conflict over water, from competition for desert oases and water holes to the battles between the Mesopotamian cities of Lagash and Umma in 4500 B.C., to the fighting between Syria and Israel over Syria's attempts to appropriate the headwaters of the Jordan River in the 1960s.²² Water conflict is most likely when rivers are shared by multiple users and downstream users are vulnerable to decisions made by upstream states. Twenty percent of the world's population is supported by the 200 largest river systems; 150 of the systems are shared by two nations, with the remaining 50 shared by three to ten nations. Particularly important river systems and the number of countries that share their river basin are: the Nile, nine; Zaire (Congo), nine; Tigris-Euphrates, four; Mekong, six; Amazon, seven; and the Zambeze, eight.²³ From a strategic perspective, upstream states have an advantage in the control of water; downstream states generally remain vulnerable to the political decisions of those upstream.

Conflict Potential in the Middle East.

Water conflict in this region has a long history, and there is great potential for renewed conflict. Since political borders in the Middle East are artificial and divide various ethnic and religious groups, all Middle East rivers and most major aquifers are international and shared by multiple states. Industrial and agricultural growth is already constrained by the lack of water. The population growth rate is among the highest in the world; by the turn of the century the population will reach 423 million, and it is expected to double in the 25 years

thereafter.²⁴ Water disputes in the region are complicated by ongoing conflict, war, large areas of desert, climate, and political instability.

There are four distinct Middle East water sources over which potential conflict looms: the Tigris-Euphrates River basin, the Jordan River basin, the West Bank ground water aquifer, and the Nile River. In each instance water represents an essential resource for the security for all involved states, and in all instances the potential for water conflict has led to communication and an effort to seek agreement, as the following summaries of past and potential conflicts suggest.

- Turkey, which controls less than 20 percent of the Tigris-Euphrates basin land mass, controls the headwaters of the basin and therefore can dictate terms to downstream users Iraq and Syria, which between them control some 66 percent of the basin. Turkey has begun a large water management scheme known as the South-East Anatolia Project (GAP). Citing its rights as upstream riparian, Turkey has begun building 22 dams and 25 irrigation systems to take advantage of its water resources. Iraq and Syria fear that as Turkey begins filling the dams, downstream flow will be substantially reduced, impairing their agricultural sectors. Extensive irrigation schemes in Turkey have already on occasion substantially reduced water quality downstream; the concern is that chemicals and salts carried away from the irrigated land will continue to degrade the quality of water reaching Syria and Iraq. Thus, both states are strategically vulnerable to political decisions made in Ankara but lack the military, political, or economic leverage to modify the behavior of Turkey, the region's strongest military state. Moreover, the dams would not be an easy military target; even if they could be breached, the resulting floods would destroy towns and irrigation schemes downstream. Because of their own bad relations, Syria and Iraq have been unable to mount a successful bilateral effort either to negotiate a settlement or to find a solution to Turkey's control. As one consequence, both have supported minority Kurdish rebels operating against the Turks. In response, Turkey is alleged to have threatened to turn off water flowing to its downstream neighbors.²⁵
- The ongoing conflict over the Jordan River basin is complex; it is perhaps the most difficult current water dispute to resolve. The Jordan River's discharge is less than two percent of that of the Nile, but it is exceptionally important to the countries involved: Israel, Jordan, Syria, Lebanon, and the new Palestinian state. The Jordan River is fed by four upstream rivers: the Dan, the Hasbani, the Baniyas, and the Yarmouk. As a result of capturing territory in the 1967 war and carving out a security zone in southern Lebanon, Israel is now the de facto upstream state for most of the Jordan river basin. This gives Israel substantial control over, and access to the major share of, the Jordan River water. Of particular interest, the headwaters of the Baniyas are located on the Golan Heights, and the Golan Heights contribute waters to the Hasbani and to Lake Tiberius, a large holding lake on the Jordan River.²⁶ Jordan has been left extremely vulnerable, as the majority of its water comes from the Jordan River. The dispute over water is being negotiated as part of the Madrid peace process; success so far has been defined as bringing all parties to the negotiating table and promoting communication and cooperation where otherwise there would have been no meaningful diplomatic contact. Recently an Israel-Jordan Peace Agreement was signed that recognized Jordan's right to "the minimal water needs of domestic uses for its survival."²⁷
- A second water resource issue that involves Israel concerns the West Bank and access to the Mountain Yaqon-Taninim aquifer. Israel has occupied the West Bank since the 1967 Arab-Israeli War and has heavily exploited the water from this aquifer. The West Bank is a highland area that catches rainfall off the Mediterranean; its subterranean aquifer tilts toward the coast and crosses the Green Line, the former Israeli boarder. Israel is now heavily dependent upon this aquifer, counting on it for between 25 and 40 percent of its sustainable water supply.²⁸ Until restrictions were put in place in 1990, Israel had consistently overdrawn water quotas from this aquifer and still heavily restricts Palestinian use. Approximately 80 percent of this water is taken by either Israel or its West Bank settlers, with only 20 percent allocated to the Palestinians.²⁹ Although Israel could continue to withdraw water from the aquifer west of the Green Line, Palestinian control of the West Bank would inevitably mean Israel's loss

of control of quantities pumped; it would also increase the possibility that toxic wastes and other pollutants from inadequate waste disposal would alter the aquifer's water quality. The dependence of Israel on this aquifer is an important dimension of ongoing peace negotiations in the Middle East.

- While Israel often receives praise for developing commercial drip irrigation technology, its management of overall water resources is not without blemish. The Crystal Plain aquifer, which is exclusively in Israeli territory and runs along the coast, has been badly overdrawn. Salt water encroachment from the Mediterranean has occurred, and salts or nitrates from agricultural pollution have contaminated at least 20 percent of this valuable aquifer.³⁰
- The Nile River is the heart of Egypt; from an airplane, one can see the green strip of agriculture and civilization that the Nile brings to what is otherwise an inhospitable desert. In 1898, Britain threatened military action when the French sent an expedition to gain control of territory that constituted the headwaters of the White Nile. The importance of upstream sources of the Nile has not been lost on subsequent Egyptian governments; Egypt has made quite clear its willingness to go to war to preserve its portion of the Nile River.³¹ Egypt depends on the Nile for 97 percent of its water supplies, yet it contributes virtually no water to the Nile. Egypt is the last downstream state on the world's longest river, which has an additional eight upstream countries with the potential to withdraw water supplies before the Nile reaches Egypt.

Precipitation in the Ethiopian highlands is the source of water for the Blue Nile, which carries 85 percent of the Nile into Sudan. At Khartoum, the White Nile provides the additional 15 percent, and the remainder flows downstream into Egypt. Fortunately for Egypt, the upstream users have been unable to mount serious development schemes that would draw upon the Nile. Disagreement between Sudan and Egypt in the late 1950s brought the nations to the edge of violent conflict, but ultimately led to a 1959 agreement allocating 55.5 billion cubic meters (bcm) of the Nile to Egypt and an additional 18.5 bcm to Sudan. By recapturing municipal waste water and agricultural runoff, and by tapping minor aquifers, Egypt was able to increase its water supply to 63.5 bcm by 1990. Egypt's demand, however, is projected to reach nearly 70 bcm by the year 2000, and its population is expected to double by the year 2027.³²

As Ethiopia recovers from the Mengistu regime and seeks to promote development, it will inevitably look toward the waters of the Blue Nile. Dams could provide irrigation to lands that are fertile but dry, and hydroelectric power to sustain new industries. Egypt's aggressive stance has been able to keep such schemes in the planning stage, and keep donors such as the World Bank from funding Ethiopian development projects. However, the region's heavy population growth, droughts in northern Africa, bad relations between Egypt and Sudan's radical Muslim government, and political pressures on newly democratic Ethiopia to satisfy the demands of its constituents portend increased conflict over this important river.

Other Regional Water Issues.

While the Middle East has been the focus of most attention, several locations in Asia also have water resource problems. The Indus River basin, which begins in Tibet and has the downstream riparian states of India and Pakistan, has long been a source of conflict between those two states. The British partition of India and Pakistan in 1947 complicated the management of water from the Indus, disrupting an irrigation system that had endured for nearly 5000 years. Shortly after the partition, conflict arose as East Punjab (India) withheld water flows to canals in West Punjab (Pakistan). These destabilizing tensions continued until 1960 when, under the leadership of the World Bank, the Indus Waters Treaty was signed on the principle of equitable apportionment of Indus water resources.³³

India has struggled elsewhere with artificial colonial borders and riparian environments. In the east, conflict exists between India and Bangladesh concerning the Ganges River, which flows from the Himalayas through

India and Bangladesh, where it joins the Brahmaputra to finally empty through multiple delta exits into the Bay of Bengal.³⁴ In 1975, India began diverting water from the Ganges upstream from Bangladesh; the latter, deprived of Ganges water, took the dispute to the United Nations. As a result of the United Nations' examining the issue, a settlement was reached in 1977 called *The Agreement on Sharing of the Ganges Waters*. While designed to last only five years, the agreement continues to govern water flows on the Ganges; from the Bangladesh point of view, the agreement provides the important aspect of natural river flows during the dry season. The recent agreement between Nepal and India concerning upstream tributaries to the Ganges, however, includes irrigation schemes, flood control, and hydroelectric dams. Undoubtedly this agreement will affect the quality and quantity of the water reaching Bangladesh; without a revision of the 1977 agreement, there is potential for renewed conflict between India and Bangladesh over the Ganges.³⁵

Although Asia and Africa, because of their high population growth rates and strategic importance, have been the focus of world attention on water conflict, other river basins have been the subject of dispute. The damming of the Parana River brought Argentina and Brazil to the conference table to resolve a difficult dispute in the 1970s. Damming and salinization were also the cause of disagreement between Chile and Bolivia over the Lauca. The United States and Mexico have been at odds over salinization and water flow quantity in the Rio Grande, while industrial pollution has caused substantial disagreement among European riparian states on the Elbe, Szamos, and Werra/Weser.³⁶

From a strategic perspective, competition over scarce water resources is taking on increased importance due to the proliferation of weapons of mass destruction. The leakage of fissile materials from Russia is thought to continue, and the availability of technology to produce chemical and biological weapons is more problematic today than at any other time. Population pressures will continue to complicate the search for solutions to regional, ethnic, religious, and resource problems; any competition over regional water resources can escalate quickly from noteworthy to significant. Because the availability of water determines the production of food, and the latest grain technologies emphasize irrigation as well as pesticides and fertilizers--all of which create water pollution problems--one can expect conflict over scarce water resources in the future. Such conflicts will have international security implications beyond their regional origins.

POLICY OPTIONS

The linkage between water scarcity and conflict is clear; given this fact, what can be done that might modify the conditions that could lead to conflict? The answer to this question traditionally was increasing sources of supply, primarily through irrigation. However, the best thinking on the subject now argues that water demand management is the key to improving the balance of supply and demand and mitigating conflict in the future. It is in the best interest of the United States, other donor nations, multinational groups, and non-governmental organizations (NGOs) to promote technologies and policies with the potential to reduce, at least at the margin, aspects of demand in situations of water resource scarcity. The best approach to reducing demand may be an integrated demand management system instituted by a government or regional commission. Such a policy looks at demand across all uses (agricultural, industrial, and urban) and uses incentives such as pricing, investment credits, and penalties to promote efficient water use. For example, after instituting an intense, countrywide demand management policy in the 1970s, Israel saw the per-unit product value of land and water increase significantly, with industrial production per unit of water increasing 80 percent.³⁷

Many things can be done to increase the efficiency of water use. Most fresh water is used in agriculture, and irrigation increasingly has been the method by which agricultural production has been expanded. Yet as a result of over-irrigation and evaporation during transport, irrigation efficiencies worldwide are only 37 percent. Experts suggest that more efficient canal system management could save ten to 15 percent of irrigation water losses.³⁸ Advanced irrigation technologies substantially improve efficiencies. For example, in

Israel row crops such as cotton, when irrigated with a drip irrigation system, had a 50-percent increase in product value over traditional sprinkler irrigation.³⁹ Drip irrigation in combination with other policies has reduced Israel's water use per irrigated acre by one-third, even as crop yields have increased. Although deep-seated political enmities in the Middle East have been a barrier to disseminating this technology in the region, Israel has worked closely with the Muslim central Asian republics in sharing it. As a result, joint irrigation projects involving Israel, Kazakhstan, and Uzbekistan have experienced "several-fold" increases in crop yield "while cutting water consumption by up to two-thirds."⁴⁰

Water use policy decisions are also central to the availability of water. In Morocco, for example, diverting five percent of the water from irrigation would double municipal water supplies. Diverting five percent of Jordan's irrigation water would increase municipal and industrial water supplies by 15 percent.⁴¹ However, reducing irrigation water could reduce the size of the agricultural sector and promote renewed migration of the rural population to urban centers, where jobs may not be available. One way to foster this change is to apply market forces and allow water to be priced at its true market value.

Subsidized water costs promote inefficiency and contribute to the 37-percent worldwide irrigation efficiency figure. In the United States, western water supplies are heavily subsidized. When the Government Accounting Office performed its 1981 study of a half-billion-dollar irrigation scheme in Colorado, it found that the water used to grow cattle feed had a delivered cost of \$54 per acre foot, while the government-subsidized price to farmers was seven cents per acre foot.⁴² According to U.S. Bureau of Reclamation figures, at one to three dollars per acre foot of water, the efficiency of irrigation is less than 40 percent; however, increase that price to \$10 per acre foot and farmers increase irrigation efficiency to levels in excess of 60 percent.⁴³ Rising prices encourage efficiency, which allows water to be diverted to the industrial or municipal sectors, thereby diversifying and strengthening the economy and making it possible for a country to purchase "virtual water" in the form of food products on the world market.⁴⁴

In addition to demand management, several other steps could be taken to reduce the potential for conflict. One is to encourage the development of an international body of laws concerning water resources that would be capable of gaining universal acceptance and practice. Another is subsidizing research for the purposes of developing new strains of crops and increasing climatic knowledge. Donor countries can also increase funding for agricultural education to improve agricultural efficiencies in the 84 percent of the world's non-irrigated cropland.⁴⁵

STRATEGIC IMPLICATIONS

With current population trends, the worldwide per capita supply of water will be reduced by approximately 33 percent by the year 2025.⁴⁶ If this situation comes to pass, one can expect additional competition for scarce resources, territorial encroachment, regional instability, and conflict. In such an environment, certain concepts should be of importance to strategists.

- Geopolitical thinking will increase in importance in the post-Cold War environment, where regional issues have become--and seem destined to remain--the chief concern of U.S. security interests.
- Saul Cohen described geopolitics as "the relation of international political power to the geographical setting,"⁴⁷ while Peter Jay refined the term to "the art and process of managing global rivalry."⁴⁸ Geopolitics is the marriage of geography and grand strategy. In today's regional security milieu, geographical variables can be ignored only at the strategist's peril. Although "the geographical setting does not determine the course of history, it is fundamental to all that happens within its borders."⁴⁹
- Homer Lea, the American who became a general in the Chinese army, wrote in 1909 that "only as long as man or nation continues to grow and expand, do they nourish the vitality that wards off disease and

decay.”⁵⁰ The Darwinesque pattern of expanding nation-state borders and territorial conquest characterized by early geopoliticians is, in general, no longer considered acceptable.⁵¹ This lack of physical expansion does not, however, mean that the vitality or competitive drive of the major states has withered. Indeed, it may be argued that Lea remains essentially correct, and that competition between the major powers is more intense now than ever. It may be that the form of competition has changed: from a quest for territorial expansion and defensible borders to a struggle for economic power, increasing gross national products, and access to the resources on which they depend. In that form, it may be the need for access to natural resources that should help underpin geopolitical strategy. Antagonists may seek to contain one another economically, leading one to expand its economy while precluding a rival from doing the same. If it is possible to deny access to essential resources to an adversary, then doing so has the same effect as physical containment: meaningful growth of power can be denied.

- Many adjustment mechanisms exist to mitigate resource scarcity, even for water. Technology, market pricing, legal doctrine development, conservation, and overall demand management policies (if aggressively applied), can contribute at the margin to reducing the imbalance between the supply and demand of fresh water. Unfortunately, barring a catastrophic reduction in world population, the exponential growth of population will overwhelm these marginal improvements and exacerbate water scarcity tensions in the next century. Because “no country can be economically or socially stable without an assured water supply,”⁵² strategists assessing regional threats to U.S. security interests would be wise to determine whether the countries of the region have access to adequate fresh water resources, as well as the policies to ensure that access, and know how their efforts to secure access might affect regional stability.
- Beware of generalizations and linear thinking; it is difficult to prove that water causes conflict. The 1967 Arab-Israel War is a case in point. Conflict generally has multiple causes, and it may be that water will serve as the catalyst to ignite an existing flammable mixture of ethnic, religious, or historical enmities. From the diplomatic perspective, environmental security issues, such as tensions over scarce water resources, may serve as a useful vehicle to promote communication and goodwill among potential regional combatants.⁵³ Thus, while it may lead to conflict, water resource scarcity may also advance the foreign policy objectives of the United States or any other nation.
- Should food prices rise in the near future, a premium will be placed on access to sufficient water to support agriculture. Several trends account for this. India will soon have the world’s largest population. India and China are struggling to feed their growing populations, and, in spite of such water resource schemes as China’s Three Gorges Dam, many experts expect China and other Asian countries to enter the world cereal market as importers. In addition, negotiations in the General Agreement on Tariffs and Trade resulted in reduced agricultural subsidies in the United States and Europe, and the Uruguay round of trade talks resulted in reduced import tariffs for agricultural products. Increased demand in Asia and a liberalization of agricultural trade portend an era of increased food prices. This will result in a shift of power to food-producing countries, and it will complicate the efforts of water-scarce developing countries to decrease their dependence on irrigation.⁵⁴

CONCLUSIONS

Water resource scarcity is an environmental security issue that currently exercises considerable influence on regional stability, particularly in arid regions. Trends in population growth, water demand, and climatic weather irregularities could make water resource scarcity more influential in geopolitical matters than heretofore has been the case.

Fresh water—who has it, who needs it—could approach access to oil in its effects on national and international security policies. The implications of this heightened importance will be noteworthy for U.S.

domestic agricultural policy, the behavior of powerful Asian states, and U.S. efforts to encourage peace in the Middle East.

Water scarcity issues such as salinization and health are often long-term and therefore less visible to the emergency management approach to foreign policy favored by so many states. Nevertheless, water issues will continue to be a strategically important variable in foreign policy development, and they should be used as an indicator of potential regional instability and a constant reminder of the importance of geographical variables to international relations and political military affairs.

ENDNOTES

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WATER CONCERNS IN THE ASIAN CONTEXT

• CHAPTER 9 •

Delia Stoehr, U.S. Pacific Command

KEY IMPLICATIONS FOR U.S. PACIFIC COMMAND

- The water deficit in the North China Plain, i.e, excess of use over the sustainable supply, may now exceed 40 billion tons per year. Ground-mining for water has been an interim solution, but when aquifers are depleted and there is nothing more to mine, the basin's water supply will be cut by nearly 40%. In the Hai River basin -- where industry and cities, including Beijing and Tianjin, now get priority-irrigated -- agriculture could largely disappear by 2010, forcing a shift back to less productive rain-fed agriculture.
- Being a problem endemic to the poor and the less developed nations of the Asia Pacific, looming water shortages are relatively low on U.S. geostrategic priority lists regarding the Asia-Pacific.
- However, tensions are rising in less-developed regions of Asia, as economic development spurs the growth of intensive agriculture and imposes severe population pressures.
- The countries currently suffering the worst shortages are those that are already near the bottom of the socioeconomic scale, partly because there has not been enough development of storage facilities.
- The rural poor suffer the most serious consequences; Cambodia and Bhutan are among nations with an acute vulnerability to water shortages, with populations already subsisting on an average of less than 10 liters a day.
- Vietnam, China, Nepal, Bhutan, Myanmar, Papua New Guinea and Cambodia have Asia's most inadequate water management, according to an index compiled by the World Panel on Financing Water Infrastructure. All face formidable investment challenges due to a low availability of water resources, insufficient storage capacity and deterioration of environmental conditions.
- The problem is -- and has been --of high priority with U.S. Country Teams of the less developed countries, and is increasingly highlighted in multilateral conferences as a high global priority two decades downstream and thereafter.
- Most importantly, the problem is significant in at least two well-developed countries -- India and China. For several past years, respective U.S. Ambassadors to these nations have spoken of the looming crisis of China's aquifer and India's "desertification."
- The aquifer in the northern half of China is drying out. Demands on the three rivers that flow eastward into the North China Plain-the Hai, the Yellow, and the Huai-are excessive, leading them to run dry during the dry season, sometimes for extended periods of time. The flow of the Yellow River into Shandong Province-the last of the eight provinces it flows through en route to the sea, and China's leading grain-producing province-has been reduced from 40 billion cubic meters (1 cu. meter = 1 ton) a year in the early 1980s to 25 billion cubic meters during the 1990s.
- In India, so much water is being drawn from underground reserves that they, and the pumps they feed, are running dry -- turning fields that have been fecund for generations, into desert.

INTRODUCTION

Within 50 years, more than half of humanity will be living with water shortages, depleted fisheries and polluted coastlines, because of a worldwide water crisis, warns a United Nations report of January 2003. Waste and inadequate management of water are the main culprits behind growing problems, particularly in poverty-ridden regions. The United Nations Environment Programme (UNEP), working with more than 200 water resource experts worldwide, produced the 2003 report. The wide-ranging report, part of the UN's designation of 2003 as the International Year of Freshwater, also documents problems such as:

- Steep drops in the size of Asia's Aral Sea, Africa's Lake Chad and Iraq's Marshlands.
- Deterioration of coral reefs.
- Rise of coastal waters because of climate changes.
- Water shortages in developing nations, crop failures and conflict over shrinking lakes and rivers -- if nothing is done to prevent wasteful irrigation and slow evaporation from reservoirs and drinking-water systems are not repaired.
- Finally, with water worth easily 70 times as much in industry as in agriculture, farmers almost always lose in the competition with cities. As water tables continue to fall, rising pumping costs will make underground water too costly for many farmers to use for irrigation.

Based on data from NASA, the World Health Organization and other agencies, the report finds:

- Severe water shortages affecting at least 400 million people today will affect 4 billion people by 2050.
- Adequate sanitation facilities are lacking for 2.4 billion people, about 40% of humankind.
- Half of all coastal regions, where 1 billion people live, have degraded through overdevelopment or pollution.

About 90% of the severe problems are in developing nations, where solutions to wasting water would lie in better irrigation and water supply practices. In developed nations such as Japan, the USA and in Europe, most water shortfalls arise from politically popular but inefficient subsidies and protections of agriculture, which accounts for 85% of freshwater consumption worldwide.

Along with drinking-water concerns, the report looks at global problems of oceans and seas:

- Coral reefs, mangrove forests and sea grass beds -- important grounds for young fish and for environmental needs -- face threats from overfishing, development and pollution.
- Oxygen-depleted seas, caused by industrial and agricultural runoff, could lead to fishery collapses and "dead zones."
- Wild-fish catches are leveling off worldwide and, with 75% of fish stocks fully exploited, fleets have turned to fish lower on ocean food chains.
- Entire fisheries may collapse as these "junk fish" are used up.
- Increased demand for fish is being made up through aquaculture, which brings other environmental concerns.

WATER SHORTAGE ISSUES SPECIFIC TO THE ASIA-PACIFIC

On 25 August 2004, the London-based New Scientist magazine warned that Asian farmers are drying up the continent's underground reserves by drilling millions of pump-operated wells to draw out water.

- Underground reserves were being depleted so alarmingly that fields might now turn into deserts.
- "This little-heralded crisis is repeating itself across Asia and could cause widespread famine in the decades to come," the magazine said in a report on scientists' findings at a recent water conference in Sweden.
- **The country worst affected is India.** There, small farmers have abandoned traditional shallow wells where bullocks draw water in leather buckets to drill 21 million tube wells hundreds of metres below the surface using technology adapted from the oil industry.

INDIA: THE INDIAN NIGHTMARE

A million wells a year are coming into operation in India to irrigate rice and sugar cane fields round the clock. While the \$600 pumps have brought short-term prosperity to many and helped to make India a major rice exporter in less than a generation, future implications are dire.

- So much water is being drawn from underground reserves that they, and the pumps they feed, are running dry, turning fields that have been fecund for generations into desert.
- Tushaar Shah, head of the International Water Management Institute's groundwater station in Gujarat, said there was no control over the expansion of pumps and wells. "When the balloon bursts, untold anarchy will be the lot of rural India," he said.

DESERTIFICATION

The same revolution is being replicated across Asia, with millions of tube wells pumping up precious underground water reserves in water-stressed countries like Pakistan, Vietnam and in northern China.

- In China's northern plain, 30 cubic kilometres of more water is pumped to the surface each year than is replaced by rain. Experts say water shortages will soon make China dependent on grain imports.
- Meanwhile, half of India's traditional hand-dug wells and millions of shallower tube wells have already dried up.
- Another consequence is electricity blackouts reaching "epidemic proportions" in some Indian states where half of the power is used to pump water from up to a kilometre down.

CHINA

The People's Republic of China (China) is the world's most populous country. However, China is already having difficulty meeting its water needs. A leading environmental group, the Worldwatch Institute, has warned that China is facing a critical water shortage, which could destabilize the region and cause world grain prices to rocket.

- In the next thirty years, demand for water will rise by nearly five times as the industrial base expands and the population increases by three-hundred-million to one-and-a-half-billion.
- China's water supply problems are becoming so severe that it's likely to have to restructure its economy to make it more water-efficient.

A little-noticed survey released in Beijing in mid-2001 reveals that China's water situation is far more serious than realized. The water table under the North China Plain, which produces over half of China's wheat and a third of its corn, is falling faster than thought.

- Overpumping has largely depleted the shallow aquifer, reducing the amount of water that can be pumped from it to the amount of recharge from precipitation. This is forcing well drillers to go down to the region's deep aquifer, which, unfortunately, is not replenishable.
- The study, conducted by the Geological Environmental Monitoring Institute (GEMI) in Beijing, reported that under Heibei Province in the heart of the North China Plain, the average level of the deep aquifer dropped 2.9 meters (nearly 10 feet) in 2000. Around some cities in the province, it fell by 6 meters.
- A recent World Bank report states, "Anecdotal evidence suggests that deep wells [drilled] around Beijing now have to reach 1,000 meters (more than half a mile) to tap fresh water, adding dramatically to the

cost of supply.” In unusually strong language for a Bank report, it forecasts “catastrophic consequences for future generations” unless water use and supply can quickly be brought back into balance.

- Further evidence of the gravity of the water situation in the North China Plain can be seen in the frenzy of well drilling in recent years. At the end of 1996, the five provinces of the North China Plain-Hebei, Henan, Shandong, and the city provinces of Beijing and Tianjin-had 3.6 million wells, the bulk of them for irrigation. During 1997, 99,900 wells were abandoned as they ran dry. Some 221,900 new wells were drilled. The desperate quest for water in China is evident as well drillers chase the water table downward.
- Between now and 2010, when China’s population is projected to grow by 126 million, the World Bank projects that the country’s urban water demand will increase from 50 billion cubic meters to 80 billion, a growth of 60 percent. Industrial water demand, meanwhile, will increase from 127 billion to 206 billion cubic meters, an expansion of 62 percent.

OVERALL, ASIA HAS MASSIVE AND LOOMING WATER SHORTAGE PROBLEMS

- Nearly 1.1 billion people worldwide, including one out of every three people in Asia, lack access to safe drinking water.
- Asia’s urban poor are among the worst hit, given that more than 40% of its urban poor lack piped water.
- Children bear the brunt of the health consequences of safe water deprivation.
- Nearly 4 billion cases annually of diarrhea occur every year, of which some 2.2 million are fatal, mostly among children under five years.

Environmentalists warn that Asia could well pay a heavy price should it repeat the same error made by western industrial powers: to give first priority to the process of industrialization and only then worry about how to keep the environment clean.

- The high rate of desertification in China, produced by the growth of industrial parks and rural establishments, is making the Gobi Desert’s winds rage all the more - jeopardizing even the Korean peninsula, Japan and the American west coast.

As many as 57 river basins in Asia are viewed as potential flashpoints for conflict between riparian neighbors, as population and development pressures strain dwindling water resources. Cooperation over shared waters is generally inconsistent or absent.

- “Riparian” areas are the green, vegetated areas on each side of streams and rivers, serving many important functions, including purifying water by removing sediments and other contaminants; reducing the risk of flooding and associated damage; reducing stream channel and streambank erosion; increasing available water and stream flow duration by holding water in stream banks and aquifers; supporting a diversity of plant and wildlife species; maintaining a habitat for healthy fish populations; providing water, forage, and shade for wildlife and livestock.
- While there is a long history of the negotiated settlement of disputes, 158 of the world’s 263 international basins, including most of those in Asia, lack a feasible cooperative management framework.

Tensions are rising in less-developed regions - especially in Asia and Africa - as economic development spurs the growth of intensive agriculture and imposes severe population pressures.

International Water Management Institute (IWMI) has predicted that 2.7 billion people, or one-third of the world’s projected population, will not have access to enough water by 2025.

- Irrigation and other forms of farm use will have to increase by 15-20% in the next 25 years to maintain food security, while water consumption needs to be reduced by 10% to protect natural watercourses.
- If current trends continue, the shortage of water will extend well beyond the semi-arid and arid regions; the rural poor will suffer the most serious consequences.
- Cambodia and Bhutan are among nations with an acute vulnerability to water shortages: their populations already subsist on an average of less than 10 liters a day.
- Climatic changes linked to global warming, including shorter rainy seasons and longer droughts, will affect other areas during coming decades, provoking new economic, social and health crises.

In a foretaste of the climatic upheaval that may be to come, much of Southeast Asia has been afflicted by intense flooding in the recent couple of years.

About 20% of Asians have no easy access to water, while many located in economically important urban areas will experience a doubling of their populations during over the next 25 years.

- Compounding the problem of water quantity is one of quality: 19% of Asians do not have safe drinking water, and 52% lack sanitation facilities, even though the overall supplies may be adequate.
- Bangladesh and India generally have enough water, but 47% of children in both countries are suffering from malnutrition or are exposed to infections, according to the United Nations Children's Fund.

Child malnutrition and hygiene levels are also critically low in North Korea (60%), Afghanistan (48%), Nepal (47%) and Cambodia (46%).

ASIA'S BIGGER CITIES ARE UNDER PRESSURE FROM A GLOBAL TREND TOWARD PRIVATIZATION OF WATER SERVICES

- For the sake of "efficiency," private water vendors have replaced public bodies in cities such as Manila and Jakarta.
- In Manila, residents continue to complain that five years after the megacity's water supply system was privatized, water woes remain. Among their chief complaints, the price of water keeps going up under a supposedly more efficient system.
- In Phnom Penh, running tap water also comes at a price for the city's poor. They have to pay nearly 50 U.S. cents per cubic meter of water; as opposed to the 60 cents they paid when buying water before from a private vendor.
- Yet this has not dampened the backing that the PPWSA's efforts are receiving, given the sore lack of access to water and quality water services that many people are experiencing in many parts of the world.

Meeting supply shortages and improving quality standards is expected to consume the bulk of development funds in the next quarter-century; but it may not be as simple as harnessing more water.

- While hydropower might offer a solution to supply shortages and help mitigate the effects of flooding, dams are often opposed on environmental grounds, while governments are on uncertain legal ground if they target multilateral basins.
- Only 30% of hydropower potential has been exploited in Asia, compared with 70% in Europe and North America and 40% in South America, reflecting the ambiguous status of shared river resources.
- Even China, with its autocratic system of government and relatively extensive access to capital, has utilized only 20% of available storage potential, though it has recently pushed ahead with a string of dams in the Mekong basin.

- There have been attempts to set up a workable management system, most notably with the establishment of the Indus Water Commission between India and Pakistan in 1960 and the Mekong River Committee in 1957.

South and Southeast Asia, with five and 18 river basins respectively, have recorded the highest incidence of water disputes, though none went beyond an outburst of political rhetoric.

- Reportedly, 231 incidents have occurred in South Asia and 134 in Southeast Asia, while East Asia had 66 “events”.

Paradoxically, volatile regions are also more likely to seek a peaceful solution. There have been 237 interactions in South Asia as a result of disputes, 371 in Southeast Asia and 84 in East Asia.

The mandate of multilateral agencies is often limited to negotiating navigation or fishing rights, raising doubts over their ability - or even willingness - to enter the sensitive realm of water-sharing rights.

- Few treaties have adequate reference to “water-quality management, monitoring and evaluation, conflict resolution, public participation and flexible allocation methods.
- As a result, most existing international water agreements continue to lack the tools necessary to promote long-term holistic water management.
- Notable exceptions include a 1996 water-sharing treaty between India and Bangladesh on the Ganga/Ganges rivers at Farakka and two treaties between India and Nepal in 1959 and 1966 that also touched on hydropower and irrigation.

A modest 20% of basin agreements are viewed as offering sufficient safeguards: most are flawed because they involve only some of the affected riparian nations, thus creating tensions with those left out.

Globally, the United Nations General Assembly has sought to establish a multilateral basis for arbitration through the wordy 1997 Convention on the Law of the Non-Navigational Uses of International Watercourses.

- However, it failed to achieve an equitable formula for sharing water and has been criticized as vague and contradictory. Ratified by a mere 12 countries, the convention has never been activated.

As development strains become more apparent, lobbying is underway for other international organizations to assume a monitoring role to transcend the patchwork of ineffective basin agreements.

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ASIA-PACIFIC ENERGY MARKET

• CHAPTER 10 •

Adapted from James P. Dorian's "Future Supply and Demand Trends in the Asian Energy Markets", Asian Energy Markets Dynamics and Trends, 2004, The Emirates Center for Strategic Studies and Research

Introduction.

Asia's economic growth rates have been among the highest in the world, and this economic growth will be accompanied by an increasing demand for energy. Between now and 2025, oil consumption in developing Asian countries is expected to rise by 3.0% annually on average, with more than one-third of this increase coming from China alone. If this growth rate is maintained, oil demand for these nations will increase from about 14.5 million barrels per day in 2000 to nearly 29.8 million barrels per day by 2025. Therefore, oil consumption levels in Asia are approaching those of North America and are significantly larger than in Europe. Much of this additional demand will need to be imported from the Middle East and Africa. Excluding cargoes bound for South Asia, most of this volume will need to pass through the strategic Strait of Malacca into the South China Sea.

With a huge population base and dramatic economic growth, the Asia-Pacific region is becoming the most critical influence on world energy markets. Continued robust growth to 2020 will even further affect global energy conditions particularly in oil, LNG, and coal. A thorough understanding of the energy future of Asia-Pacific region is of huge importance to industry and government for strategic planning purposes.

However, it is extremely difficult to project Asia-Pacific energy trends to 2020 with any degree of certainty, partly because the region is a complex mix of developed, developing, and newly industrialized economies and has the world's fastest economic growth. China, for example, can be characterized as having as many as 15 separate electricity markets, with some regions having a surplus of electricity, others in deficit. Because of Asia's large and ever increasing dependence on imported crude oil, numerous external factors must be integrated into any analysis, including world oil prices and supply. Similarly, the issue of coal and gas substitution is a vital but uncertain factor, because of the great difficulties involved in projecting energy developments in China and the countries of the former Soviet Union or the impact of such developments on the region.

Many governments in the Asia-Pacific region are seeking to modernize their energy industries to boost efficiencies, achieve economies of scale, and better protect their environments. Efforts are also underway to attract energy related investment and technology as a means of promoting economic growth. While some Asian countries have been successful at attracting foreign capital to their energy industries, others are still in the early stages of revamping investment legislation to make climates more favorable.

Macroeconomic Outlook.

During the past thirty years, most Asia-Pacific countries have enjoyed spectacular economic growth.¹ Economic success not only has increased the region's share of the global economy, but also has exerted significant impacts on world energy markets, since the region is a net energy importer. In terms of economic performance, it will continue to be the most dynamic region in the world, both in the immediate and long-term.

Although economic growth has varied considerably from country to country, it is expected to be more uniform across Asia during the entire outlook period, 2000-2020. During that period growth rates of gross domestic product (GDP) will increase at an average annual rate of 5.5 percent for developing Asia under a moderate economic growth scenario compared to a 3.2 percent change for the total world.

Continued Prosperity and Growth.

Long-term prosperity is predicted in Asia for several reasons, including a solid workforce, continued banking and financial sector reform, tremendous natural resources, and high education levels. Continued growth will require increased energy consumption, with much of the region's new sources of supply being met through oil and product imports from the Middle East. The Middle East remains the heart of the global oil industry, containing over two-thirds of the proven oil reserves and one-third of proven gas. Recent forecasts predict that the oil output of the Middle East could have to increase by over 50 percent in the next ten years to meet the expected rise in global oil demand.

With rapid growth in the Asian economies over the last two decades, there has also been rapid growth in energy demand and electricity demand, with resulting increases in oil imports. This growth is expected to continue over the coming decades, with energy demand expected to grow 25 percent and electricity demand by 37 percent in Asia by 2010.²

Several observations of Asia's economy, energy industry, and environment provide a context of the importance of the region to the rest of the world in terms of resource consumption and use.

- 60 percent of the world's population today is in Asia, or 3.5 billion people;
- By 2025, that number will grow to 5 billion, a 40 percent increase;
- Last century, when the world's population tripled, energy and natural resource consumption grew ten-fold (with much of that consumption based on the combustion of fossil fuel);
- In Asia, by 2025 resource consumption, infrastructure development, and service delivery will have to be increased by 40 percent simply to maintain the status quo;
- Asia will remain the world's fastest growing regional economy to 2020;
- By 2020, 54 percent of Asians will live in urban areas; and
- While there are 10 "megacities" in Asia today (10 million residents or more), this may rise to 20 by 2025.
- The use of conventional energy like oil, coal, and electricity has increased enormously in the last 25 years in Asian economies. During the 1980s consumption more than doubled, with an average annual growth rate of 7 percent.
- A majority of the Asian economies are in an industrialization phase, and this increases their energy intensity. The increased energy demand is to a large extent covered by increasing fossil fuel consumption.
- One-third of the world's coal reserves lie in Asia, more than any other region in the world, while two-thirds of global trade in LNG occurs within the region.

By 2020, many Asian countries and groups of countries will probably play an even greater role in energy markets than they do today.

NORTHEAST ASIA REGION

CHINA

The People's Republic of China (China) is the world's most populous country and the second largest energy consumer (after the United States). Production and consumption of coal, its dominant fuel, is the highest in

the world. Rising oil demand and imports have made China a significant factor in world oil markets. China also surpassed Japan as the world's second-largest petroleum consumer in 2003.

China currently needs energy more than ever. Its quest to secure enough oil and gas to keep its economy humming will change the world. As China's economy expands, so does its thirst for oil, gas, coal, and electricity. Today, China accounts for 12.1% of the world's energy consumption. That's second only to the U.S., at 24%, and up from 9% a decade ago. China's whole modernization strategy is based on access to abundant supplies of energy. Its hungry basic industries such as steel, aluminum, and chemicals devour electricity and coal. A mushrooming middle class consumes growing quantities of heating oil and gasoline. By 2010 analysts expect some 56 million cars, minivans, and sport-utility vehicles to be rolling on China's highways -- more than twice the number today. By 2020 the country's demand for oil will nearly double, to 11 million barrels a day, natural gas consumption will more than triple, to 3.6 trillion cubic feet annually, and coal use will grow by 76%, to 2.4 billion tons a year, according to a U.S. Energy Dept. forecast.

That means China will play a key role in influencing global oil prices and energy investment flows -- not to mention climate-destabilizing carbon dioxide emissions. With China consuming ever more oil, it risks developing an ever-greater dependency on foreign vendors of crude. For the security-obsessed Chinese, that's pretty scary. Right now, though, it's hard to see how the Chinese will avoid the same fate as the U.S., which is uncomfortably dependent on oil states such as Nigeria, Saudi Arabia, and Venezuela. Just a decade ago, China was a net exporter of oil, but now it imports 40% of its crude as output declines at the big northeastern fields near Daqing and Liaohe. What about developing new sources at home? China is sitting on potentially rich reserves in the high, dry deserts of the far west, but gas and oil there lie much deeper than in the northeast and will cost far more to get out of the ground. And given the country's primitive pipeline and transportation networks, moving it to the coastal cities that need it will be a challenge.

With China's entry into the World Trade Organization (WTO) in November 2001, the Chinese government made a number of specific commitments to trade and investment liberalization, which, if fully implemented, will substantially, opens the Chinese economy to foreign firms. In the energy sector, this will mean the lifting or sharp reduction of tariffs associated with imports of some classes of capital goods, and the eventual opening to foreign competition of some areas such as retail sales of petroleum products.

TAIWAN

Located across the Taiwan Strait from mainland China (80 miles at the closest point), Taiwan is a leading economic and trading center, with one of the busiest ports in the world (Kaohsiung). As Taiwan lacks sufficient domestic energy sources, it is almost totally dependent on energy imports.

Oil is by far the dominant fuel in Taiwan's energy mix, accounting for 48% of total primary energy consumption. Coal also plays an important role (34% of total energy consumption), followed by nuclear power (9%), natural gas (8%), and hydroelectric power (less than 2%). Taiwan has very limited domestic energy resources and relies on imports for most of its energy requirements. The country's industrial sector accounts for about 42% of total energy demand, but this share is expected to decline slightly, since Taiwan's economy is moving toward newer, less energy-intensive industries. The transportation sector accounts for one-third of total energy demand.

Taiwan's current crude oil production is under 1,000 bbl/d, compared to crude oil consumption of 876,000 bbl/d. Most of Taiwan's crude oil imports come from the Persian Gulf, though West African countries also are important suppliers. To ensure against a supply disruption, Taiwan's refiners are under a regulatory requirement to maintain stocks of no less than 60 days of consumption. Refiner-held strategic petroleum stocks are the norm in Asia, and Taiwan's policy is similar to those of Japan and South Korea.

Responding to growing fuel demands in the region, as well as a domestic shift away from oil-fired power generation, Taiwan seek to export more of its fuel refining production. Taiwan increased refining capacity by about 69% during the past 10 years. Now the country's refining capacity exceeds its domestic consumption of petroleum products, making Taiwan a net exporter.

SOUTH KOREA

The Republic of Korea (South Korea) is important to world energy markets as the fifth largest oil importer, and the second largest importer of Liquefied Natural Gas (LNG).

In South Korea, oil consumption rose during the past two decades at an average rate that was among the highest in the world. The projected growth rate in energy use will slow down markedly over the 2000-2020 period, as the Korean transportation sector reaches saturation levels. Nonetheless, South Korea oil demand is expected to add 1.2 million barrels per day to world oil demand in the forecast period, only slightly less than that of Western Europe. South Korea's only significant indigenous source of energy is coal.

The South Korean government has plans to privatize several large state-owned enterprises (SOEs), including the state electricity utility, Korean Electric Power Corporation (KEPCO), and the natural gas monopoly Korea Gas Company (KOGAS). The privatization program has moved at a slower pace than originally planned, due in part to strong opposition from labor unions to some of the privatizations and delays in passing implementing legislation. The South Korean government decided in June 2004 to limit the privatization of the electric power sector to generation facilities, retaining ownership over the transmission and distribution assets of KEPCO.

JAPAN

Japan's economic stagnation since the early 1990s led to a period of consolidation in the country's energy sector. Energy demand has been stable, and Japan's energy industries, particularly the downstream oil sector, underwent a period of downsizing and consolidation. Tokyo has taken important steps towards economic deregulation and restructuring. Japan remains important to the world energy sector, though, as one of the major exporters of energy-sector capital equipment, as well as engineering, construction, and project management services. The renewed economic growth in the recent year is leading to higher energy demand. Japan is still the world's fourth largest energy consumer and second largest energy importer (after the United States).

Japan lacks significant domestic sources of energy and must import substantial amounts of crude oil, natural gas, and other energy resources, including uranium for its nuclear power plants. In 2002, the country's dependence on fossil fuel imports for primary energy stood at more than 80%. Oil provided Japan with 49.7% of its total energy needs, coal 18.9%, nuclear power 13.7%, natural gas 12.7%, hydroelectric power 3.7%, and renewable sources 1.1%. About half of Japan's energy is used by industry and about one-fourth by transportation, with nearly all the rest used by the residential, agricultural, and service sectors. Japan's energy intensity (energy use per unit of GDP) is among the lowest in the developed world.

SOUTH ASIA REGION

The South Asian region (Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka) is notable for its large and rapidly growing population (more than one-fifth of the world total).

Asia has resulted in rapid increases in energy consumption in recent years, well above rates seen in the OECD. The Energy Information Administration (EIA) estimates of South Asia's primary energy consumption

showed an increase of nearly 64% between 1992 and 2002 (EIA energy statistics include only “commercial” energy sources and not animal waste, wood, or other biomass, which accounts for more than half of South Asia’s total final energy consumption). In 2002, South Asia accounted for approximately 4.1% of world commercial energy consumption, up from 2.8% in 1991. Despite this growth in energy demand, however, South Asia continues to average among the lowest levels of per capita energy consumption in the world, but among the highest levels of energy consumption per unit of GDP.

Discounting “non-commercial” sources of energy including animal waste, wood, and other biomass, South Asia’s commercial energy mix in 2002 was 46% coal, 34% petroleum, 12% natural gas, 6% hydroelectricity, 1% nuclear and 0.3% “other.” There are significant variations within the region.

- Bangladesh’s energy mix, for example, is dominated by natural gas (66.4% in 2002), while India relies heavily on coal (54.5% in 2002).
- Sri Lanka and the Maldives are overwhelmingly dependent on petroleum (82% and 100%, respectively); Pakistan is diversified among petroleum (42.7%), natural gas (42.2%), and hydroelectricity (10%).
- The Himalayan countries of Bhutan and Nepal have the highest shares of hydroelectric power in their energy consumption mix at 80% and 31%, respectively, in 2002.

South Asian nations are faced with rapidly rising energy demand coupled with increasingly insufficient energy supplies. Most of South Asia is already grappling with energy shortfalls, typically in the form of recurrent, costly, and widespread electricity outages. Because of the economic and political ramifications arising from such shortfalls, improving the supply of energy, particularly the supply of electricity, is an important priority of national and local governments. The countries of South Asia are looking to diversify their traditional energy supplies, promote additional foreign investment for energy infrastructure development, improve energy efficiency, reform and privatize energy sectors, and promote and expand regional energy trade and investment.

INDIA

The Republic of India (India), the world’s sixth largest energy consumer, plans major energy infrastructure investments to keep up with increasing demand--particularly for electric power. India also is the world’s third-largest producer of coal, and relies on coal for more than half of its total energy needs.

Oil accounts for about 30% of India’s total energy consumption. The majority of India’s roughly 5.4 billion barrels in oil reserves are located in the Mumbai High, Upper Assam, Cambay, Krishna-Godavari, and Cauvery basins. The offshore Mumbai High field is by far India’s largest producing field, with current output of around 260,000 barrels per day (bbl/d). India’s average oil production level (total liquids) for 2003 was 819,000 bbl/d, of which 660,000 bbl/d was crude oil. India had net oil imports of over 1.4 million bbl/d in 2003.

Future oil consumption in India is expected to grow rapidly, to 2.8 million bbl/d by 2010, from 2.2 million bbl/d in 2003. India is attempting to limit its dependence on oil imports somewhat by expanding domestic exploration and production.

India has had a longstanding territorial dispute with Pakistan over the ownership of Kashmir, which has led to a tense relationship between the two countries since the partition of British India in 1947. India’s rivalry with Pakistan has direct relevance to the country’s energy sector, as it impedes plans for regional natural gas and/or oil pipelines (i.e., from Iran or Central Asia).

After many years of pursuing economic policies based on import substitution and state ownership of key industries, India’s government embarked on a series of economic reforms in the mid-1990s. While reforms

in the electric utilities sector under the Electricity Act of 2003 are continuing, the government has abandoned the full privatization of the state-owned petroleum sector.

SOUTHEAST ASIA REGION

INDONESIA

Indonesia is important to world energy markets because of its OPEC membership and substantial, but declining, oil production. Indonesia also is the world's largest liquefied natural gas (LNG) exporter.

Despite impressive economic growth in recent years, increasing budget deficits caused by oil price subsidies on the local market, could lead to future problems.

2003 was the last year of the IMF assistance program designed to pull Indonesia's economy out of the emergency situation that had developed during the 1997/98 Asian financial crisis. In March 2003, the IMF disbursed the scheduled \$469 million tranche of its bailout package after reporting that Indonesia had made good progress instituting reforms. The IMF review cited Indonesia's continued economic growth, decreasing inflation rates, and strengthened banking sector as examples of progress made, while mentioning that more reforms were still necessary. Conditions of the \$43 billion bailout agreement included improving the transparency of government financing and especially the operation of government-owned enterprises such as the state-run PT Pertamina oil monopoly. The government expressed a commitment to reforms, but the actual progress has been limited – especially among urgently needed foreign investors – that Indonesia's efforts to improve transparency have faltered.

The regional challenges facing the Indonesian government remain the same: a separatist movement in Aceh, an oil and gas rich province in north Sumatra which abuts the strategically important Strait of Malacca; and a separatist movement in Irian Jaya, a gas-rich province at the eastern end of the country. The government is also managing threats posed by an Al Qa'ida-linked terrorist group, Jemaah Islamiyah. Jemaah Islamiyah was responsible for the 2001 nightclub bombing in Bali, a 2003 hotel bombing in Jakarta, and is now targeting Western business and political figures in Indonesia, according to recent reports. Jemaah Islamiyah is seeking to undermine foreign economic interests in the country, according to Western security officials.

Tension exists between the central government in Jakarta and leadership at the regional level. The distribution of oil and gas revenues between the central government in Jakarta and regional governments in areas which produce oil and gas has been regularly disputed. Since Indonesia's transition to democracy in 1999, the country's regional governments have been pressing for a greater share of oil and gas revenues. In particular, the separatist movement in Aceh continues to cause security problems for oil and gas companies in that region, despite the government's energetic offensive against the separatists.

MALAYSIA

Malaysia is important to world energy markets because of its 75 trillion cubic feet of natural gas reserves and its net oil exports of over 300,000 barrels per day.

Malaysia contains proven oil reserves of 3.0 billion barrels, down from 4.3 billion barrels in 1996. Despite this trend toward declining oil reserves, Malaysia's crude oil production has risen in the last two years as a result of new offshore development. In 2002, crude oil production averaged 699,000 bbl/d. That figure rose to an average of 750,000 bbl/d for 2004. Total liquids production for 2004 was 855,000 bbl/d, which includes

80,000 bbl/d of natural gas liquids. Malaysia's oil demand has been growing at a much slower rate than its economic output, due to conservation efforts and the conversion of oil-fired power plants to natural gas.

As a result of the long-term trend toward declining oil reserves, Petronas, the state oil and gas company, has embarked on an international exploration and production strategy. Currently, Petronas is invested in oil exploration and production projects in Syria, Turkmenistan, Iran, Pakistan, China, Vietnam, Burma, Algeria, Libya, Tunisia, Sudan, and Angola. Overseas operations now make up nearly one-third of Petronas revenue. Malaysia exports the majority of its oil to markets in Japan, Thailand, South Korea, and Singapore.

ExxonMobil produces about 335 Mmcf/d at its offshore Bintang natural gas field in the South China Sea, which contains about 1 Tcf of proven reserves. Commercial production at Bintang began in February 2003.

Malaysia accounted for approximately 14% of total world LNG exports in 2003. After much delay, Malaysia is proceeding with a long-planned expansion of its Bintulu LNG complex in Sarawak. In February 2000, Petronas signed a contract with a consortium headed by Kellogg Brown and Root for construction of the MLNG Tiga facility, with two LNG liquefaction trains and a total capacity of 7.6 million metric tons (370 Bcf) per year, which was completed in April 2003. The Bintulu facility as a whole is now the largest LNG liquefaction center in the world, with a total capacity of 23 million metric tons (1.1 Tcf) per year. Most of the production from the new LNG trains will be sold under term contracts to utilities in Japan. Tokyo Electric Power (TEPCO), Tokyo Gas, and Chubu Electric all import LNG from the project. BG signed a contract in August 2004 for supplies over a 15-year period to the United Kingdom, to begin in 2007 or 2008. Shell brought two additional fields online in 2004, Jintan in March, and Serai in September, both of which feed into the Bintulu export terminal. The two fields added over 1 Mmcf/d to Malaysia's gas production.

In addition to LNG, Malaysia exports 150 million cubic feet per day (Mmcf/d) to Singapore via pipeline. Surprisingly, Malaysia also is an importer of gas from Indonesia. Petronas signed an agreement in April 2001 with Indonesia state oil and gas company Pertamina for the import of gas from Conoco's West Natuna offshore field in Indonesian waters. The move is being seen as part of a Malaysian strategy to become a hub for Southeast Asian natural gas integration. Deliveries from the pipeline commenced in mid-2003. The pipeline connects to an existing pipeline from the shore to Malaysia's offshore Duyong field, which helped to minimize construction costs.

SINGAPORE

Singapore is a major refining center for Southeast Asia, with refining capacity of nearly double its rate of petroleum products consumption. It is also strategically located near the Strait of Malacca, a major route for oil tankers. Singapore's strategic location at the entrance to the Strait of Malacca has helped it become one of the most important shipping centers in Asia. The Port of Singapore, the world's busiest in terms of shipping tonnage, is a key component of Singapore's prosperity and economic health.

Singapore has a total crude oil refining capacity of nearly 1.3 million barrels per day (bbl/d). The three main refineries include: ExxonMobil's 580,000-bbl/d refinery, Royal Dutch/Shell's 430,000-bbl/d refinery on Pulau Bukom island, and the Singapore Refining Corporation's (SRC) 285,000-bbl/d refinery. The Asian economic crisis of 1997-98 had a negative impact on Singapore's refining industry, and Singapore's refining companies lost significant business due to declining demand for oil products in the region. While the region staged a recovery from the financial crisis in 1999 and 2000, the construction of new refineries in Singapore's traditional export markets has not picked up. New refineries in India, particularly the 540,000-bbl/d Reliance Petroleum refinery at Jamnagar, which began production in 2000, have reduced Indian demand for imports of refined products. The Melaka refining complex in Malaysia also has become a competitor. In early 2004, Thailand made clear its intentions to become a regional energy hub with the completion of its Sri Racha oil center. To counter the growing competition to its energy hub status in the region, Singapore in February 2004 announced plans to lower by 50% corporate income taxes on oil companies that do business in the country.

In response to increasing competitive pressures, individual refinery operators in Singapore have been exploring various restructuring measures. The overall outlook for Singapore's refiners is still uncertain, with so much capacity being developed elsewhere in Asia.

THAILAND

Thailand is a significant net oil importer. Energy consumption is growing rapidly as a result of strong economic growth.

Thailand's energy sector is undergoing a period of restructuring and privatization. The Thai electric utility and petroleum industries, which historically have been state-controlled monopolies, are currently being restructured.

Thailand contains 583 million barrels of proven oil reserves. In 2003, Thailand produced 259,000 barrels per day (bbl/d) of oil, an increase of about 49,000 bbl/d from the previous year. Of that production, only about 96,000 bbl/d was crude oil. Most of the remainder was natural gas liquids (NGLs) and lease condensate. Oil consumption in 2003 was 851,000 bbl/d, up from 843,000 bbl/d in 2002. Demand growth in Thailand has slowed somewhat since 2002, largely as a result of increasing substitution of natural gas in electricity generation and increased use of ethanol in motor fuels.

Thailand has four oil refineries, with a combined capacity of 703,100 bbl/d. The three main refineries are Shell Co. Of Thailand Ltd. (275,000 bbl/d) located in Rayong, Thai Oil Co. Ltd., in Sriracha (192,850 bbl/d), and Esso Standard Thailand Ltd. (173,500 bbl/d), also located in Sriracha.

SOUTH CHINA SEA

The South China Sea, which encompasses the Southeast Asia Region, is the world's second busiest international sea-lane. More than half of the world's supertanker traffic passes through the region's waters. In addition, the South China Sea region contains oil and gas resources strategically located near large energy-consuming countries. The South China Sea is rich in natural resources such as oil and natural gas. These resources have garnered attention throughout the Asia-Pacific region. The economic potential and geopolitical importance of the South China Sea region has resulted in jockeying between the surrounding nations to claim this sea and its resources for themselves.

AUSTRALIA

Australia is the world's leading coal exporter. Although there is more exploration yet to be done, Australia's proven oil and natural gas reserves have nearly doubled in recent years. The government is currently in the process of developing infrastructure to bring more of Australia's natural gas reserves to market. Australia's growth rate in oil consumption is projected to have a much higher growth rate than Japan's. In spite of being an important producer of crude oil and condensates, in its international trade balance, Australia is a net importer.

Australia is an energy resource-rich country with significant petroleum, natural gas and coal reserves. Australia's energy consumption is dominated by coal, which fuels most of the country's power generation. Petroleum also accounts for a large share of energy consumption. Natural gas use is relatively small, but it has been growing rapidly in recent years. As a result of expanding consumption in a period of declining production, Australia is facing growing dependence on petroleum imports. Although foreign investment in the energy sector remains high, many Australians believe that a restrictive regulatory climate and the government's failure to provide incentives for potential investors have lessened further growth. In 2003, for

example, several U.S.-based companies made plans to sell their Australian pipeline assets as a result of the regulatory climate.

Australia is one of the few OECD countries that is a significant net energy exporter. It has been the world's largest coal exporter since 1986, and it is the sixth largest exporter of LNG. Australia's prospects for expanding energy exports in the future are promising, as Asian demand for both coal and LNG rises. In the future, Australia can expect increasing export competition from China -- in coal, and Indonesia -- in both coal and LNG. Japan, the largest importer of Australian coal, is considering taxing coal imports to encourage consumption of other fuels. As a result, long-term growth of Australia's coal exports is contingent on Asia's response to global warming concerns.

In June 2004, the Australian government issued "Securing Australia's Energy Future," commonly known as the "White Paper," which forecasted that energy demands will grow 50% by 2020. The paper's endorsement of the increased use of coal has been controversial with the Australian public and environmental lobbies, especially since the recently reelected government has made no commitment to ratify the Kyoto Treaty.

CONCLUSION

While Asia-Pacific is as varied across countries as it is vast, combined, the region is fast becoming the critical player in world energy markets. Some of the countries such as China and India are rapidly becoming formidable competitors for markets, capital, and technology innovation with OPEC and the U.S.. By 2020 many Asian countries and groups of countries may play an even greater role in energy markets than they do today as trade involving the region will increase significantly, particularly after 2010.

SUBSEQUENT ECONOMIC UPDATES

21 April 2005

Indonesia is struggling to boost oil production and hopes to avoid a forced exit from OPEC.

- Falling oil output made Indonesia a net importer of oil for several months in 2004.
- Indonesia is struggling to meet its OPEC output quota of around 1.4 million barrels a day.
- Indonesia only produced 961,200 barrels a day in March and only 942,000 barrels a day in February – a 30 year low point.

An Indonesian study came up with 3 options regarding Indonesia's faltering OPEC status: a) maintain OPEC status until declared a net oil importer and disqualified as an OPEC member, b) withdraw from OPEC, or c) downgrade to a new "observer status" in OPEC.

Economic Advisor's Comment:

President Yudhoyono wants to stay in OPEC and he helped to restart state oil company Pertamina's talks with Exxon-Mobil on 20 April in hopes of resolving a long running commercial dispute over a massive oil field in Cebu.

- Bringing the Cebu field on line would add up to 165,000 barrels a day of oil output and help Indonesia avoid a forced exit from OPEC.
- A deal with Exxon-Mobil would also boost confidence in President Yudhoyono's government and attract badly needed foreign investment and new oil exploration.

- POTUS brought up the contentious Exxon-Mobil dispute at the APEC meeting in Chile in November.
- President Yudhoyono is anxious to see concrete progress in these talks so that the dispute doesn't detract from President Yudhoyono's talks with POTUS in Washington in May.

13 May 2005

With crude oil prices around \$ 50 a barrel, Russia -- the world's second-largest oil producer after Saudi Arabia -- is realizing an oil windfall in 2005.

- Russia's oil exports are forecast to earn Russia \$90 billion, up from \$14.5 billion in 1998.
- The oil industry is volatile. To protect the budget against drops in the price of oil in the future, Russia initially followed the example of Norway and created a Stabilization Fund in 2004.
- However, instead of reserving the Stabilization Fund as a nest egg to stabilize finances and the budget, Moscow is already using the fund to boost unnecessary government spending.

Economic Advisor's Comment:

Russia's revised policy toward the Stabilization Fund is the latest sign that advocates of fiscal discipline are losing ground to the populists in Moscow.

- This looser fiscal policy is boosting inflation, which Moscow has to counter with higher interest rates, which in turn slows down the economy.
- In addition, Russia's oil riches are strengthening the currency and overpricing Russia's manufacturing exports.
- Oil riches have also sparked strife among interest groups. The most serious crisis was Moscow's arrest of Mikhail Khodorkovsky (the founder of the Yukos oil group), and the seizure and nationalization of Yukos' biggest asset, Yuganskneftegaz.
- This government crackdown has scared off potential investors, reduced oil production, and slowed down economic growth.

24 June 2005

China National Offshore Oil Corporation (CNOOC), a 70% Chinese government owned company, has made a \$19.6 billion offer to buy Unocal, the US oil and gas group:

- The biggest overseas bid yet by a Chinese company.
- The first to trigger a contested takeover battle with Chevron.
- The first to be made in a politically strategic sector in the US.

Chinese previous investment in the US was in bonds and securities, now China is increasingly turning to investments in US companies:

- In 2004, China's Lenovo Ltd. made a successful bid to buy a \$ 1.25 billion bid for IBM's PC unit.
- This week, China's Haier Group launched a \$1.28 billion bid for appliance maker Maytag.

Economic Advisor's Comment:

The Committee on Foreign Investments in the US (CFIUS) and US lawmakers will have to decide on whether or not to try to curb CNOOC's bid for Unocal.

The US business community says it would be a big mistake for the USG to interfere in a CNOOC bid.

- US firms have far more at stake in investments going the other way and fear PRC retaliation.
- As the world's biggest debtor, the US is ill placed to reject private sector investments by the PRC, one of its largest creditors.
- Moreover, CNOOC is taking the biggest commercial risk as well as a strategic risk: If Sino-US hostilities erupted; its proposed US investment would be an early casualty.

On the other hand, many US lawmakers argue that the CNOOC bid should be vetted on more traditional national security grounds.

- They are fearful that the US would be losing a national energy asset if they did not work to block the CNOOC bid.
- They are afraid that CNOOC might decide to hoard Unocal energy for Chinese consumers, thus reducing oil supplies for US consumers, driving up prices and threatening US energy security.

28 June 2005

Rising oil prices are starting to strain Asian economies.

- High oil prices may have the following effects:
 - Threaten Japanese economic growth.
 - Slow down the South Korean economy.
 - Raise concerns in Thailand and India about widening deficits in their current account (which measures goods and services in their balance of payments).
- Thai PM Thaksin urged state enterprises to find ways to cut non-essential imports.
- In response, Thai Airways is taking a second look at taking delivery of 5 new Airbus aircraft this year.

Economic Advisor's Comment:

While China's bid for Unocal highlights Asian efforts to secure new energy supplies, what's needed is a better strategy to reduce Asia's appetite for energy.

- Asia accounts for 40% of this year's rise in oil demand.
- India, China and Thailand burn 2 to 3 times more oil per unit of output than the US and Europe.
- Indonesia spent \$7 billion on energy subsidies in 2004 and oil subsidies were also high in India, Malaysia and Thailand in 2004.
- Energy subsidies reduce incentives to curb oil use and needlessly increase budget deficits.
- On the positive side, China, India, Malaysia, Indonesia and Thailand have recently increased fuel prices, although not to market levels.

What's needed in Asia is a concerted effort to a) further cut fuel subsidies and b) use energy more efficiently in order to ease pressure on global oil prices and improve Asian economic growth.

14 July 2005

Japan granted a domestic oil company (Teikoku) the right to test-drill for gas in the Xihu Trench -- a disputed area of the East China Sea.

- Tokyo's decision flies in the face of threats from Beijing that this action would undermine bilateral relations.

- Prior to Tokyo's announcement the Chinese foreign ministry warned:
 - “If Japan obstinately grants its enterprises test-drilling rights, China would see that as constituting serious damage to its interests and rights within China's sovereignty and it will further complicate the situation in the East China Sea.”

Economic Advisor's Comment:

This dispute over energy reserves -- especially those on shared maritime borders -- is one of the main strategic flashpoints in the Sino-Japanese relationship.

- The Xihu Trench undersea natural-gas fields are located in an area of open sea east of Shanghai that both Japan and China claim is within their Exclusive Economic Zones.
- China has already conducted test drilling on its side of the Xihu Trench.
- Japan contends any reserves China discovers could come from a field that also lies on the Japanese side and has demanded a halt to Chinese exploration.

Corporate competition is relatively recent. For more than 30 years Japan barred its companies from drilling in the disputed gas fields for fear of angering China.

- However, the global energy shortfall and China's new economy may have persuaded Japan it needs to be more assertive.
- Sino-Japanese tensions intensified on 14 April after Beijing called Tokyo's decision to allow oil exploration in a disputed area of the East China Sea a “serious provocation.”
- Tokyo tried in vain to head off the dispute:
- The Japanese Vice-Minister for Foreign Affairs made an ill-fated public proposal on 14 April that the two sides conduct joint energy operations in the East China Sea.
- From 23-24 April Japan's foreign minister met with his counterpart in a vain attempt to resolve this dispute.

22 July 2005

Asia's economic slowdown is easing the demand for oil and starting to drive down global oil prices.

- The connection between Asian economic performance and global oil supplies has come full circle.
- When Asia was on a roll earlier in the year, the region was the impetus for over 40% of the rise in global oil demand, which helped to drive the price of oil to over \$60 a barrel.
- Higher oil prices:
 - Weighed on consumer spending in Asia
 - Lowered Asian corporate earnings
 - Reduced Asia's overall economic growth rate

Economic Advisor's Comment:

As Asia's growth slowed, Asia's appetite for energy got smaller and oil inventories rose.

- For the first time in months the cushion in oil supply is showing signs of widening.
- OPEC, which supplies almost 40% of the world's oil, now expects its spare capacity to average 8% of global demand in the second half of 2005, compared with 5% a year ago.
- Inventories in consuming countries have also increased, with US commercial stocks last month exceeding 1 billion barrels for the 1st time since August 2002.

The global stock cover now equates to 74 days of foreign demand.

- The last time the global stock was at this level was the 4th quarter of 2002, when oil prices were below \$30 a barrel.
- Not surprisingly, oil prices on 19 July fell for the 4th day in a row, with August futures slipping to \$57.10 a barrel -- \$5.00 lower than the level reached on 7 July.

So why don't oil prices in 2005 fall even more to say \$30 a barrel as they did in 2002?

- Oil traders -
 - Doubt the veracity of OPEC's data
 - Fear a lack of refining capacity to produce heating oil this winter
 - Fear possible oil supply disruptions because of geopolitical instability

28 July 2005

The US Congress has amended the energy bill to potentially block a Chinese takeover of Unocal pending the outcome of an energy security study.

- The study will look at the implications of China's energy needs for US security.
- The amendment would increase the time it would take for a CNOOC to complete the regulatory process necessary to buy Unocal from a maximum of 90 days to at least 141 days.
- It would also broaden the set of issues to be considered beyond a narrow definition of national security.
- Some US lawmakers want to go further and require the US Committee on Foreign Investments to consider economic security alongside national security in all cases.

Economic Advisor's Comment:

US concerns that Chinese acquisition of oil companies somehow threatens US energy security are understandable - but ill-advised.

- Fact is these concerns are at odds with how the global energy market actually works.
- For starters, oil is the ultimate fungible commodity.
- For every barrel of oil China might divert for its exclusive use, China would import one less barrel of oil from other sources.
- The global price and availability of oil to the US would remain exactly as before.

While denial of access to oil can be used as a military tool in wartime, this depends not on ownership but on the ability to secure installations and blockade oil lanes.

- China is vastly more vulnerable to an oil squeeze than the US, with its unchallenged navy.

A national security issue does exist here, but it cuts the other way.

- US efforts to block PRC takeovers of US companies plays into the hands of PRC communist hard-liners.
- PRC hard-liners argue that China must prepare for an inevitable confrontation with the US because the US will never permit China to enjoy a peaceful economic rise.
- The US needs to prove that the PRC hardliners are wrong with evidence to the contrary.
- The US has a strong interest in persuading countries like Indonesia to open their oil reserves to US investors.

- But it's inconsistent for the US to criticize the Indonesians for nationalism in its oil industry if the US is nationalistic in blocking foreign investment in the US oil industry.

If the US wants to improve energy security there is also plenty it could do at home.

- The US could increase domestic oil production, subsidize alternative fuels, and cut consumption by imposing higher fuel efficiencies and imposing higher gasoline taxes.

03 August 2005

(U) China's CNOOC dropped its offer to buy US oil producer Unocal.

- CNOOC ran into trouble when Congress wanted the White House to study the economic security and energy security implications of CNOOC's bid.
- That would have stalled any CNOOC deal at least 6 months.
- Unsure of White House support, US lawmakers ended up striking a deal last week.
- Congress inserted into the energy bill a study requirement that would have put the CNOOC deal on hold for at least 141 days.
- CNOOC's withdrawal means rival Chevron Corporation will almost certainly win control of Unocal.

Economic Advisor's Comment:

The collapse of CNOOC's bid to purchase Unocal reflects rising US-PRC tensions and the growing pains Chinese companies face as they try to expand in the global marketplace.

- In essence, CNOOC sailed into a "perfect storm" of anti-China sentiment now gripping Washington.
- On the economic front, Congress is angry about the huge US trade deficit with China, the strength of the Chinese currency, the alleged loss of US jobs to "unfair PRC competition," high global gas prices and China's acquisition of natural resources around the world.
- In addition, Congress is concerned about China's military buildup and China's denial of political and religious freedoms.
- Chinese President Hu Jintao will have a difficult time countering this anti-China sentiment when he visits Washington next month.

05 August 2005

High oil prices are threatening Indonesia's economic and financial security.

- Though Indonesia continues to export lots of oil, the country now imports more than it exports.
- As a net oil importer, the high imported oil prices are undermining Indonesia's efforts to cut domestic fuel subsidies.
- Paying for imports is soaking up scarce foreign reserves and offsetting recent cuts in the politically sensitive government oil subsidies.

Economic Advisor's Comment:

At the current rate of subsidies, Indonesia could be facing an oil shock as early as October 2005.

- Outlays for energy subsidies could reach more than \$12 billion in 2005, 40% more than the government had budgeted.

- The \$7.8 billion allocated for fuel subsidies in the 2005 budget will be used up by the end of September 2005.
- Indonesia will need to allocate \$4.5 billion more to maintain domestic fuel prices at current levels.
- Otherwise, the country won't have sufficient funds to import oil in 4Q 2005.

But if Jakarta spends more on politically attractive oil subsidies it would mean:

- Increasing its budget deficit (and alarming foreign investors over financial instability).
- Curbing infrastructure spending that is a critical foundation for stronger economic growth.

The core problem reflects decades of oil mismanagement - especially too little investment in exploration and refining.

- Indonesian state controlled oil companies have a limited ability to increase oil and gas production.
- Jakarta estimates crude-oil production in 2005 will decrease about 6% from last year's 968,000 barrels a day.

One option might be for US oil companies that have superior drilling technology to buy Indonesia's oil assets and boost exploration and production.

- However, US oil companies are now finding it difficult to make a case for buying foreign oil assets after China's CNOOC was frustrated in its bid to buy the assets of Unocal, a US oil company.

18 August 2005

(U) After days of acute gasoline shortages from Guangdong to Shanghai, China rushed emergency gasoline deliveries to the worst-hit southern cities on 19 August.

- The fuel shortages had generated long lines at the gas pump and provoked rising anger among Chinese motorists.
- This rising anger at the gas pump was just the latest sign of an increasingly assertive middle class that has mobilized with growing frequency in protest over government policies.
- While the long lines at the gas pumps are now getting shorter, the structural problem has not disappeared.

Economic Advisor's Comments:

The fuel shortages reflect Beijing's resistance toward removing the last vestiges of China's central planned economy, which for years kept prices artificially low.

- While Beijing has removed most other price controls, it has kept a tight grip on oil prices.
- Beijing has been fearful that rising oil prices in China would unleash inflation and a societal backlash.

The root cause of the current fuel shortages is the wide disparity between rising global oil prices and low local oil prices in the PRC.

- The government has refused to allow local pump prices to rise in tandem with the global benchmark price.
- Global oil prices have risen 30% in 2005 but PRC prices have only risen half that amount.
- This situation leaves local refiners such as Sinopec suffering large financial losses.

- In response, Chinese oil companies have opted to sell their refined oil overseas, where they can get free market prices, thus worsening the fuel shortfall within China.

To eliminate fuel shortages Beijing needs to allow local pump prices to rise in tandem with global free market oil prices.

- Free market oil prices would enable PRC oil companies to make a profit selling their refined oil at home.
- Once these oil companies become financially healthy, they would be in a position to increase China's low oil refining capacity as well as drive more oil exploration and production needed to increase the supply of oil.
- None of this will be decisive unless China uses the energy it has more efficiently.

23 August 2005

On 22 August, a Chinese oil company outbid an Indian oil company in a bidding war to purchase an oil company in Kazakhstan.

- China's largest state-owned oil company -- China National Petroleum Corp. -- said it had struck a \$4.18 billion agreement to buy PetroKazakhstan Inc., a Canadian-based oil company whose operations are solely in Kazakhstan.
- ONGC Videsh Ltd. -- the international arm of India's state-controlled Oil & Natural Gas Corp. that initially lost out in the bidding war -- was reportedly planning a higher counter-offer.
- Whether PetroKazakhstan would be receptive to a new Indian offer is unclear.
- But under the agreement, PetroKazakhstan would have to pay the Chinese company a \$125 million penalty if it accepts a rival counter-offer at this point.

Economic Advisor's Comment:

Although oil is a fungible commodity, Beijing and Delhi think otherwise and are fearful about their dependence on foreign oil.

- China relies on oil imports for 40% of consumption while India relies on oil imports for 70% of its consumption.
- Both want to lock up oil resource supplies as they push to rapidly industrialize.
- Despite recent talk of Sino-Indian energy cooperation, the bidding war over PetroKazakhstan shows that India and China are shaping up as fierce competitors.
- Delhi feels it must do more to keep pace with China because Indian oil companies are at a disadvantage next to Chinese companies.
- Chinese companies have access to cheaper loans through the Chinese state and are better able to stomach the exorbitant costs of buying oil assets at a time of high crude prices.

Finally, the recent fuel shortages in China have reinforced a sense of vulnerability for the Chinese, especially in southern China.

- Chinese motorists recently experienced long gasoline lines at the pump.
- The shortages bolstered Beijing's conviction that the country must secure foreign oil fields in order to guarantee a steady supply of fuel to the economy.

Nevertheless, the core PRC oil problem isn't related to crude-oil supplies, which remain tight but sufficient in China.

- The core problem is the government price controls on refined-oil products, which is forcing domestic refineries to sell gasoline and diesel at below-market prices at home.
- As a result, many refineries have been sending their gasoline and diesel to countries where they can make a profit and sell at market prices, thus creating shortages in China.

25 August 2005

(U) After initially losing out to China in a bid to buy Petro Kazakhstan, a Canadian oil company in Kazakhstan, India is redoubling its efforts to join forces with China for other global energy resources.

- An Indian Joint Task Force visited China from 8-13 August and raised the issue of joint Sino-Indian bidding for assets.
- The Indians reportedly found strong support from Chinese state-run firms for joint bidding and cooperation in order to gain economies of scale and negotiating muscle.

The recent bidding war between China and India for the Petro Kazakhstan oil company was too far down the road to reel back.

- But the loss of the India's bid for Petro Kazakhstan has convinced India's Oil Minister Mani Shankar Aiyar to visit Beijing in November to adopt a collaborative approach.

Economic Advisor's Comment:

Whether or not China and India can somehow agree to join forces in oil bidding, the two countries face major challenges to securing new oil reserves.

- For instance, the vast reserves in the Persian Gulf states - some two-thirds of the world's total reserves - are mostly off-limits to foreign companies.
- International oil giants like Chevron and Exxon-Mobil guard their choice assets elsewhere.

Even the US - generally regarded as a free trade oriented country - is now loathe to let oil assets fall into foreign hands, as the uproar and opposition in the US Congress showed at the time of Cnooc's failed bid to buy UNOCAL.

- In addition, Western oil rival blocked Cnooc and fellow PRC oil company Sinopec's attempts to buy stakes in Kazakhstan's huge Kashagan oil field in 2003.
- Russia has thwarted China's CNPC oil company's efforts over the past few years to buy into Russian energy fields.

Admittedly, China's purchase this week's of Petro Kazakhstan would constitute the largest overseas takeover by a Chinese company.

- But this Canadian company is still a small player in the global oil market.
- Petro Kazakhstan currently produces fewer than 100,000 barrels a day, or little more than 1% of China's daily oil needs.

30 August 2005

Hurricane Katrina threatens to close energy production in the Gulf of Mexico and Louisiana refining systems for an extended period and deal a blow to some Asian economies.

- Katrina sent oil prices soaring above \$70 a barrel on 29 August and the US dollar initially sagged before rebounding.

- US bond prices rose as investors sought a haven from the surge in oil prices.

Most Asian currencies and stocks tumbled following the latest oil-price jump.

- The Singapore dollar slipped to a new one-month low against the US dollar, while the Taiwan dollar plunged to a fresh 8-month low. The Yen also was weaker.
- Asian stock markets fell across the board, especially in South Korea, where stocks dropped 2.2% and Taiwan stocks fell 1.4% -- its lowest settlement level since 2 June.
- Tokyo's stocks fell 1%, while Hong Kong's stocks fell 0.97%.

Economic Advisor's Comment:

Before Katrina hammered this chunk of the world's energy supply, Asia's prospects for the rest of the year appeared promising.

- A pickup in growth was expected for the second half of 2005 after a slow start in the first half of 2005.

But the global energy supply was extremely vulnerable to disruption, with virtually no spare capacity.

- Katrina has shut down 12% of US crude oil production and 10% of US refining capacity.
- While it's too early to sound an alarm for Asia's major economies, Katrina could send oil prices to \$80 a barrel and natural gas to \$15 per million British thermal unit.
- A jump in prices could hurt the US economy, and by extension, the economies in Asia that export to the US

Soaring oil prices could deal a blow to Asia's weakest links - Indonesia and the Philippines.

- To a lesser extent, Thailand is sensitive to elevated oil prices because of its high inflation.
- However, the region's biggest economies -- Japan, China and India - should remain relatively resilient after the initial shock.

ENDNOTES

¹ Though as a region Asia will enjoy strong economic growth to 2020 and a growing thirst for energy, it must also be recognized that there are some significant problems in the region, including the realization that most of the world's 800-900 million poor live in Asia. In addition, the region's powerhouse—Japan—continues to have economic problems, which are damaging prospects for regional economic activity. Japan's economic problems are structural in nature and deep-rooted (for example in the banking sector), and macroeconomic policies alone cannot prompt a turnaround. Nonetheless, Asia's economic prosperity is expected to help eliminate some poverty in the region. In this context, the Asian Development Bank has set a goal of eliminating poverty in Asia by 2015.

² Draft background paper for Ministerial/Industry Panel on Clean and Sustainable Energy Development at the APEC Ministerial, May 11, 2000.

ENERGY ISSUES AND CHALLENGES

• CHAPTER 10 • APPENDIX •

Compiled by Delia Stoehr, U.S. Pacific Command

Worldwide energy consumption is expected to grow by 59% over the next two decades. Fully one-half of that projected growth is forecast to occur in the Developing Countries of Asia (including China, India and South Korea), owing to current robust economic growth, which will spur growing demand for energy. Oil consumption levels in Asia are approaching those of North America, and are currently significantly larger than in Europe. Several countries -- primarily China, Indonesia and Malaysia -- are leading global producers of energy, while other nations are heavy consumers -- such as Japan and South Korea. With a huge population base and dramatic economic growth, the Asia-Pacific region is becoming the most critical influence on world energy markets.

Many governments in the Asia-Pacific region are seeking to modernize their energy industries to boost efficiencies, achieve economies of scale, and better protect their environments. Efforts are also underway to attract energy related investment and technology as a means of promoting economic growth. While some Asian countries have been successful at attracting foreign capital to their energy industries, others are still in the early stages of revamping investment legislation to make climates more favorable.

Discussed below, in the following order, are details of the energy issues and challenges of: CHINA, SOUTH KOREA, INDIA, JAPAN, AUSTRALIA, INDONESIA, MALAYSIA, SINGAPORE, TAIWAN, THAILAND, NORTH KOREA, RUSSIA and SOUTH ASIA and SOUTHEAST ASIA REGIONAL ISSUES, to include the unique energy issues of THE SOUTH CHINA SEA.

Following CONCLUSIONS, at the end of the chapter, for background purposes, is a listing of important chronological energy-related events in 2005, and also 2004.

CHINA

The People's Republic of China (China) is the world's most populous country and the second largest energy consumer (after the United States). Production and consumption of coal, its dominant fuel, is the highest in the world. Rising oil demand and imports have made China a significant factor in world oil markets. China also surpassed Japan as the world's second-largest petroleum consumer in 2003.

China currently needs energy more than ever. Its quest to secure enough oil and gas to keep its economy humming will change the world. As China's economy expands, so does its thirst for oil, gas, coal, and electricity. Today, China accounts for 12.1% of the world's energy consumption. That's second only to the U.S., at 24%, and up from 9% a decade ago. China's whole modernization strategy is based on access to abundant supplies of energy. Its hungry basic industries such as steel, aluminum, and chemicals devour electricity and coal. A mushrooming middle class consumes growing quantities of heating oil and gasoline. By 2010 analysts expect some 56 million cars, minivans, and sport-utility vehicles to be rolling on China's highways -- more than twice the number today. By 2020 the country's demand for oil will nearly double, to 11 million barrels a day, natural gas consumption will more than triple, to 3.6 trillion cubic feet annually, and coal use will grow by 76%, to 2.4 billion tons a year, according to a U.S. Energy Dept. forecast.

That means China will play a key role in influencing global oil prices and energy investment flows -- not to mention climate-destabilizing carbon dioxide emissions. With China consuming ever more oil, it risks developing an ever-greater dependency on foreign vendors of crude. For the security-obsessed Chinese, that's pretty scary. Right now, though, it's hard to see how the Chinese will avoid the same fate as the U.S., which is uncomfortably dependent on oil states such as Nigeria, Saudi Arabia, and Venezuela. Just a decade ago, China was a net exporter of oil, but now it imports 40% of its crude as output declines at the big northeastern fields near Daqing and Liaohe. What about developing new sources at home? China is sitting on potentially rich reserves in the high, dry deserts of the far west, but gas and oil there lie much deeper than in the northeast and will cost far more to get out of the ground. And given the country's primitive pipeline and transportation networks, moving it to the coastal cities that need it will be a challenge.

Albeit China is the world's most populous country -- with a rapidly growing economy -- its economic development has proceeded unevenly, with urban coastal areas, particularly in the Southeast, experiencing more rapid economic development than other areas of the country. China has a mixed economy, with a combination of state-owned and private firms. A number of state-owned firms have undergone partial or full privatization in recent years. The Chinese government has encouraged foreign investment -- in some sectors of the economy and subject to constraints -- since the 1980s, offering several "special economic zones" in which foreign investors receive preferable tax, tariff, and investment treatment.

In March 2003, a long-expected transition in China's political leadership took place. Hu Jintao assumed the country's presidency, as well as chairmanship of the ruling Communist Party. Wen Jiabao became the new premier.

With China's entry into the World Trade Organization (WTO) in November 2001, the Chinese government made a number of specific commitments to trade and investment liberalization, which, if fully implemented, will substantially, opens the Chinese economy to foreign firms. In the energy sector, this will mean the lifting or sharp reduction of tariffs associated with imports of some classes of capital goods, and the eventual opening to foreign competition of some areas such as retail sales of petroleum products.

Despite moves toward privatization, much of China's economy remains controlled by large State Owned Enterprises (SOE's), many of which are inefficient and unprofitable. Restructuring of the SOE sector, including the privatization of some enterprises, is a major priority of the government, as is restructuring of the banking sector. Many Chinese banks have had to write off large amounts of delinquent debts from state-owned enterprises.

Layoffs have been part of the restructuring of the SOEs, as many were severely overstaffed. This has created unemployment, and also has been a burden on the government budget, as the government begins to provide social benefits, which were previously the responsibility of the SOEs. The geographic concentration of privately owned industry in the urban centers along the coast also has created social strains.

China's real gross domestic product (GDP) grew at a rate of 9.1% in 2003, up from 8.0% in 2002. Real GDP for the first quarter of 2004 was up 9.8% year-on-year -- a pace many observers see as unsustainable. Real GDP growth was forecasted to drop to 8.1% by the end of 2004. Much of the increase in the GDP growth rate has come from excessive spending on capital goods and construction, particularly in the state sector. In an effort to cool an economy seen as overheating, the Chinese government took a number of steps in the second quarter of 2004 designed to counter this trend. Monetary policy was tightened, and measures adopted to slow spending on capital projects and rein in bank lending. China's banking sector remains a key concern for the country's economic stability, as the ratio of problem loans has been rising.

Inflows of foreign direct investment (FDI) into China in 2003 totalled \$53.5 billion, a new record, but with the year-on-year growth rate slowing considerably. Japan, Taiwan, and the United States are China's most important sources of FDI.

After a sharp rise in 2002, China's trade surplus shrank in 2003. The 2003 trade surplus was \$25.3 billion, down from \$30.3 billion in 2002. Imports increased by 39.9% in 2003, largely capital goods being acquired to refurbish outdated industrial facilities. Exports increased by 34.6% in 2003.

Oil.

China was the world's second largest consumer of petroleum products in 2003, surpassing Japan for the first time, with total demand of 5.56 million barrels per day (bbl/d). China's oil demand is projected by EIA to reach 12.8 million bbl/d by 2025, with net imports of 9.4 million bbl/d. As the source of around 40% of world oil demand growth over the past four years, Chinese oil demand already is a very significant factor in world oil markets.

China's petroleum industry has undergone major changes over the last decade. In 1998, the Chinese government reorganized most state owned oil and gas assets into two vertically integrated firms -- the China National Petroleum Corporation (CNPC) and the China Petrochemical Corporation (Sinopec). Before the restructuring, CNPC had been engaged mainly in oil and gas exploration and production, while Sinopec had been engaged in refining and distribution. This reorganization created two regionally focused firms -- CNPC in the north and west -- and Sinopec in the south, though CNPC is still tilted toward crude oil production and Sinopec toward refining. Other major state sector firms in China include the China National Offshore Oil Corporation (CNOOC), which handles offshore exploration and production and accounts for more than 10% of China's domestic crude production, and China National Star Petroleum, a new company which was created in 1997. Regulatory oversight of the industry now is the responsibility of the State Energy Administration (SEA) which was created in early 2003.

The intention of the restructuring was to make these state firms more like similar vertically integrated corporate entities elsewhere. In connection with this process, the firms have been spinning off or eliminating many unprofitable ancillary activities such as running housing units, hospitals, and other services near company facilities. Massive layoffs also have been undertaken, as like many other Chinese SOEs, they were severely overstaffed.

The three largest Chinese oil and gas firms - Sinopec, CNPC, and CNOOC - all have successfully carried out initial public offerings (IPOs) of stock between 2000 and 2002, bringing in billions of dollars in foreign capital. CNPC separated out most of its high quality assets into a subsidiary called PetroChina in early 2000, and carried out its IPO of a minority interest on both the Hong Kong and New York stock exchanges in April 2000. The IPO raised over \$3 billion, with BP the largest purchaser at 20% of the shares offered. Sinopec carried out its IPO in New York and Hong Kong in October 2000, raising about \$3.5 billion. Like the PetroChina IPO, only a minority stake of 15% was offered. About \$2 billion of the IPO was purchased by the three global super-majors - ExxonMobil, BP, and Shell. CNOOC held its IPO of a 27.5% stake in February 2001, after an earlier attempt in September 1999 was canceled. Shell bought a large block of shares valued at around \$200 million. In 2002, Chinese oil companies began to look at separating out some of their business units into subsidiaries. CNPC has set up subsidiaries for drilling services and geological survey work, and plans to eventually spin them off through international IPOs. CNOOC also has created an oilfield services unit -- China Oilfield Service, Ltd. (COSL) -- which was listed on the Hong Kong stock exchange in November 2002.

Some aspects of these stock offerings were atypical. First, they all involved only minority stakes. Second, they have not given the foreign investors a major voice in corporate governance. The Chinese government still holds majority stakes in all three firms, and the foreign investors have not received seats on their boards of directors. Analysts have generally seen these investments as attempts by the supermajors to gain a foothold in China, which will necessarily involve partnerships with the Chinese majors. Even with the opening to foreign investment envisioned in China's commitments for membership in the WTO, it is still likely that almost all major oil and gas projects in China will involve one of the Chinese majors. The Chinese government stipulated in July 2001 that only CNPC and Sinopec will be allowed to open new retail filling stations prior to fulfillment of China's market-opening commitment in 2004. This is seen as an attempt to strengthen their control of retail sales of petroleum products and ensure that foreign firms will have to partner with one or the other of the Chinese majors to enter the retail market, even after 2004. All three of the global supermajors, BP, ExxonMobil, and Shell, are planning to enter the Chinese retail market in partnership with CNPC, Sinopec, or both.

As a net oil importer since 1993, China's petroleum industry is focused on meeting domestic demand. China had sold a modest quantity of very light crude oil for direct burning in Japanese power plants, but exports to Japan were halted in January 2004.

Most Chinese oil production capacity, close to 90%, is located onshore. One field alone, Daqing in northeastern China, accounts for about 1.0 million bbl/d of China's production, out of a total crude oil production of around 3.4 million bbl/d. Daqing is a mature field, however, having begun production in 1963,

and production fell by 3.5% in 2003. At China's second-largest producing field, Liaohe in northeastern China, CNPC has contracted with several foreign firms for work to enhance oil recovery and extend the life of the field. Chinese authorities announced a "major" new find in April 2004 in the area of the existing Shengli field in the northeast, but it is still under assessment. Government priorities focus on stabilizing production in the eastern regions of the country at current levels, increasing production in new fields in the West, and developing the infrastructure required to deliver western oil and gas to consumers in the East. Offshore development also is a high priority. Chinese officials have said that they expect production in Xinjiang to reach 1 million bbl/d by 2008, but that seems ambitious, given that transportation of that oil to consumers in the East remains a major obstacle.

Recent offshore oil exploration interest has centered on the Bohai Sea area, east of Tianjin, believed to hold more than 1.5 billion barrels in reserves, and the Pearl River Mouth area. ConocoPhillips announced in March 2000 that it had completed its appraisal drilling of the Peng Lai find in Block 11/05, and would proceed with development. Commercial production began in December 2002, and is around 32,000 bbl/d as of mid-2004. CNOOC signed a production sharing contract with Canadian independent Husky Oil in July 2001 for Block 39-05 in the Pearl River Mouth, near the Wenchang 13-1/13-2 blocks, where Husky Oil and CNOOC currently are producing about 50,000 bbl/d. Another major offshore oilfield has been developed in the Pearl River Mouth area by a consortium including ChevronTexaco, ENI, and CNOOC. The field began production in February 1999. ChevronTexaco also concluded an agreement with CNOOC in October 2002 for the development of the Bozhong field in the Bohai Sea, which has reserves estimated at 1.3 billion barrels. Meanwhile, improvement in Sino-Vietnamese relations has opened the way for oil and gas exploration in the Beibu Gulf (known in Vietnam as the Gulf of Tonkin). China and Vietnam signed an agreement in December 2000 which settled their outstanding disputes over sovereignty and economic rights in offshore areas near their border. CNOOC opened a tender for 10 new exploration blocks in May 2004.

With China's expectation of growing future dependence on oil imports, China has been acquiring interests in exploration and production abroad. CNPC has acquired oil concessions in Kazakhstan, Venezuela, Sudan, Iraq, Iran, and Peru, and Azerbaijan. Sinopec also has begun seeking to purchase overseas upstream assets. The Greater Nile Petroleum Operating Company (GNPOC), the Sudanese oil project in which CNPC owns a stake, began exports in August 1999. CNOOC also has purchased an upstream equity stake in the small Malacca Strait oilfield in Indonesia. Despite efforts to diversify its sources of supply, roughly half of China's imported oil comes from the Middle East, with Saudi Arabia alone accounting for 17% in 2003.

The most significant deal thus far is CNPC's acquisition of a 60% stake in the Kazakh oil firm Aktobemunaigaz, which came with a pledge to invest significantly in the company's future development over the next twenty years. The Kazakh and Chinese governments signed an agreement in May 2004 for the construction of a \$700-million pipeline to export Kazakh crude oil into western China. The pipeline would run from Atasu in central Kazakhstan to Xinjiang, supplying three refineries with about 200,000 bbl/d of crude oil. While the intergovernmental agreement cites a completion date of late 2005, this is considered unlikely, and negotiations on a binding contract and pricing continue.

Russia's Far East is seen as a potential source of Chinese crude oil imports. The Russian and Chinese governments have been holding regular discussions on the feasibility of pipelines to make such exports possible. One proposed plan is a pipeline which would carry as much as 1 million bbl/d of crude oil from Anagarsk in Russia to join the existing Chinese pipeline network at Daqing. Yukos Oil of Russia and CNPC signed a memorandum of understanding in June 2003 for sales of oil via the pipeline, contingent on the pipeline being built. An alternative plan, proposed by Russian pipeline operator Transneft, would take Russian crude from both West Siberia and East Siberia via a 1 million bbl/d pipeline to an export terminal at the Pacific coast port of Nakhodka. Japan and China each have undertaken intense efforts to sway Russia toward their preferred pipeline option. As of mid-2004, most analysts expect the Nakhodka pipeline to prevail, with Japan offering to heavily subsidize the construction of the pipeline and provide other financial assistance to Russia, but no binding agreement has yet been concluded.

Downstream infrastructure development in China centers primarily on upgrading existing refineries rather than building new ones, due to overcapacity. In the late 1990s, the Chinese government shut down 110 small refineries, which generally made inferior quality petroleum products. Dozens of other small refineries owned by provincial and local governments have been merged into CNPC and Sinopec. Another major issue in the Chinese downstream sector is the lack of adequate refining capacity suitable for heavier Middle Eastern crude oil, which will become a necessity as Chinese import demand rises in the mid-term future. Several existing refineries are being upgraded to handle heavier and more sour grades of crude oil. With consumption of petroleum products rising so rapidly, some interest is being rekindled in the construction of more modern greenfield refineries. Shell has reportedly been in discussions with CNOOC on a possible project in Guangdong.

Chinese officials have spoken of their intention to build a national strategic petroleum reserve, and Chinese officials announced a policy decision in February 2003 to support the creation of a strategic petroleum reserve, and have reportedly been studying several options for the development of storage capacity. In the meantime, anecdotal evidence has suggested that China may have built up its petroleum stocks substantially in 2003 and 2004. According to press reports, work has already begun preliminary work in early 2004 on four initial storage facilities, which would provide 30 days of import cover by 2008.

Natural Gas.

Historically, natural gas has not been a major fuel in China, but given China's domestic reserves of natural gas, which stood at 53.3 trillion cubic feet (Tcf) at the beginning of 2004, and the environmental benefits of using natural gas, China has embarked on a major expansion of its gas infrastructure. Until the 1990s, natural gas was used largely as a feedstock for fertilizer plants, with little use for electricity generation. Natural gas currently accounts for only around 3% of total energy consumption in China, but consumption is expected to nearly double by 2010. This will involve increases in domestic production, and imports, by pipeline and in the form of liquefied natural gas (LNG).

The country's largest reserves of natural gas are located in western and north-central China, necessitating a significant further investment in pipeline infrastructure to carry it to eastern cities. CNPC has a pipeline under construction, the "West-to-East Pipeline," from natural gas deposits in the western Xinjiang province to Shanghai, picking up additional gas in the Ordos Basin along the way. Construction began in July 2002, and a section of the pipeline east of the Ordos Basin began operation in early 2004. The segment connecting to Xinjiang will be completed by 2005. While it was expected initially that several major foreign oil and gas companies would take stakes in the project, it has progressed without foreign equity participation.

China announced the discovery of a major gas field at Sulige in the Ordos Basin in the Inner Mongolia Autonomous Region, adjacent to the Changqing oilfield, in 2001. While the field is still under evaluation, unofficial reserve estimates cited in the trade press put reserves in the range of 16-21 Tcf, substantially more than was assumed when the discovery was first announced. Some natural gas from the Ordos Basin is likely to be put into the West-to-East Pipeline, which was to run through the area in any case, to help make it economically viable. A pipeline was completed in 1997 between the Ordos Basin and Beijing, and a second pipeline may become necessary, as demand for natural gas in Beijing, Tianjin, and nearby Hebei province already is outstripping the capacity of the original pipeline. If reserves prove adequate, the pipeline to Beijing may eventually be extended to other cities to the northeast.

Another proposed pipeline project would link the Russian natural gas grid in Siberia to China and possibly South Korea via a pipeline from the Kovykta gas fields near Irkutsk, which hold reserves of more than 50 Tcf. The cost of the project has been estimated at around \$12 billion. The pipeline would have a planned capacity of 2.9 billion cubic feet per day (Bcf/d), of which China would likely consume about 1.9 Bcf/d and South Korea 1 Bcf/d. The main South Korea gas company, Kogas, formally joined the feasibility study in November 2000, and both Kogas and CNPC signed letters of intent for the project in November 2003. The main foreign backer of the project is BP, which owns a 30% stake in Russia Petroleum, the license holder for the Kovykta gas field. Due to tensions on the Korean peninsula, the route currently under consideration for the section of

the pipeline to South Korea would bypass North Korea by running undersea from the city of Dalian in China to the South Korean coast near Seoul. The new route also would bypass Mongolia. Gazprom has taken an increasingly prominent role in the negotiations for the final contract in 2004, and Chinese and South Korean observers have increasingly seen LNG imports as a viable alternative if agreement cannot be reached on pricing and terms for Russian natural gas imports.

Aside from these huge projects, other pipelines are being developed to link smaller natural gas deposits to other consumers. A pipeline was completed in early 2002 linking the Sebei natural gas field in the Qaidam Basin with consumers in the city of Lanzhou. Another planned project would link gas deposits in Sichuan province in the southwest to consumers in Hubei and Hunan provinces in central China at an estimated cost of \$600 million.

One major hurdle for natural gas projects in China is the lack of a unified regulatory system. Currently, natural gas prices are governed by a patchwork of local regulations. The Chinese government is in the process of drafting a new legal framework for the natural gas sector, but the process has been slow, and there are still considerable uncertainties regarding price regulation and taxation issues dealing with natural gas sales.

Offshore gas projects also are becoming a significant part of China's gas supply. The Yacheng 13-1 field, developed in the mid-1990s, has been producing gas for Hong Kong and Hainan Island since 1996. The Chunxiao gas field in the East China Sea, being developed by China National Star Petroleum, is also expected to become a significant producer within the next decade. The company puts the field's reserves at more than 1.6 Tcf. Another area where exploratory drilling is planned is the Xihu Trough, in the East China Sea about 250 miles east of Shanghai. Shell concluded an agreement with CNOOC and Sinpec for development of the Xihu Trough reserves in January 2004.

Imported liquefied natural gas (LNG) will be used primarily in China's southeastern coastal region, with possible later expansion in the north, particularly if Russian supplies fail to materialize. Guangdong province already has launched a project to build six, 320-megawatt (MW) gas-fired power plants, and to convert existing oil fired plants with a capacity of 1.8 gigawatts (GW) to LNG. In March 2001, it was announced that BP had been selected to build China's first LNG import terminal, to be located near the city of Guangdong. BP will take a 30% equity stake in the project, with CNOOC holding 31% and the rest held by local firms from Guangdong and Hong Kong. A supply contract has been signed for LNG from Australia's North West Shelf LNG terminal. Earlier delays have been resolved, and the terminal is expected to begin operation before the end of 2005. A second LNG terminal is planned for Zhangzhou, in Fujian province farther up the coast. A supply agreement has been concluded with BP for LNG from its Tangguh project in Indonesia. A third LNG import project in Zhejiang is under consideration for a startup date around 2010, but it is in the preliminary stages and has not secured government approval. China has been increasingly interested in LNG suppliers in the Persian Gulf, and has held talks with Iran, which resulted in a preliminary "framework agreement" for LNG sales, which was signed in March 2004.

Coal.

Coal makes up the bulk, 65%, of China's primary energy consumption, and China is both the largest consumer and producer of coal in the world. China's coal consumption in 2002 was 1.42 billion short tons, or 27% of the world total. The Chinese government has made major upward revisions to coal production and consumption figures covering the last several years. The new figures show coal consumption rising sharply in 2001-2002, reversing the decline seen from 1997 to 2000. The decline during that period also is much less than the previously reported data.

China's coal industry has had a serious oversupply problem in recent years, particularly in the late 1990s, and the government has begun implementing major reforms aimed at reducing the oversupply, returning large state-owned mines to profitability as a prelude to possible future privatization, and reducing mine accidents. Large state-owned coal mines had experienced buildups of unused inventories in the mid-to-late-

1990s, and many were operating at a financial loss. A large number of small, unlicensed mines also have added to the oversupply. In 1998, the government launched a large-scale effort to close down the small mines. Many small coal mines were ordered closed. It has become clear, however, through much anecdotal evidence, that not all of the “closed” mines have actually ceased operation, and the upward revisions to the Chinese State Statistical Bureau’s production and consumption figures appear to reflect this. China also is increasingly seeking export markets for its coal as a way of dealing with its surplus production, and as of 2002 it was the world’s second-largest coal exporter. Japan and South Korea are the primary markets, and China is beginning to emerge as a serious competitor to Australia for Japanese coal imports. India also has been importing modest quantities of Chinese coal. Increased domestic demand for thermal coal in 2004, however, has led to a sharp dropoff in coal exports, reversing the price decline in the Asian coal market which had taken place in response to the expansion of Chinese exports.

Over the longer term, China’s coal demand is projected to rise significantly. While coal’s share of overall Chinese energy consumption is projected to fall, coal consumption will still be increasing in absolute terms. Several projects exist for the development of coal-fired power plants co-located with large mines, so called “coal by wire” projects. Other technological improvements also are being undertaken, including the first small-scale projects for coal gasification, and a coal slurry pipeline to transport coal to the port of Qingdao. Coalbed methane production also is being developed, with recent American investors in this effort including BP, ChevronTexaco, and Virgin Oil, which was awarded a concession for exploration in Ningxia province in January 2001. ChevronTexaco is the largest foreign investor in coalbed methane, with activities in several provinces. Far East Energy of the U.S. received approval from Chinese authorities in April 2004 for a farmout agreement with ConocoPhillips, under which it would undertake exploratory drilling for coalbed methane in Shaanxi province, in a location near the West-to-East Pipeline route.

In contrast to the past, China is becoming more open to foreign investment in the coal sector, particularly in modernization of existing large-scale mines and the development of new ones. The China National Coal Import and Export Corporation is the primary Chinese partner for foreign investors in the coal sector. Areas of interest in foreign investment concentrate on new technologies only recently introduced in China or with environmental benefit, including coal liquefaction, coal bed methane production, and slurry pipeline transportation projects. Over the longer term, China plans to aggregate the large state coal mines into seven corporations by the end of 2005, in a process similar to the creation of CNPC and Sinopec out of state assets. Such firms might then seek to pursue foreign capital through international stock offerings.

China has expressed a strong interest in coal liquefaction technology, and would like to see liquid fuels based on coal substitute for some of its petroleum demand for transportation. A coal liquefaction facility is under construction by the Shenhua Group in Inner Mongolia, with a projected startup date of 2005. Despite the high costs, Chinese officials have shown increasing interest in further research into improving coal liquefaction technologies, in the hope that it may eventually provide an economically viable domestic source of liquid fuels.

Electricity.

As with coal, China’s electric power industry experienced a serious oversupply problem in the late 1990s, due largely to demand reductions from closures of inefficient state-owned industrial units, which were major consumers of electricity. The Chinese government responded to the short-term oversupply in part by implementing a drive to close down small thermal power plants and by imposing a moratorium (with a few exceptions) on approval of new power plant construction, which ran through January 1, 2002. Until recently, the backlog of projects approved in the mid-1990s had kept pace with demand increases. In 2003, however, the Chinese government has approved 30 major new electric power projects, with a total of around 22 gigawatts (GW) of capacity. With the surge in economic growth in 2003 came a surge in electric power demand, which has outpaced previous demand forecasts, leading to a shortage of generating capacity and even load-shedding in some areas. A shortage of rainfall in some areas in 2003 and early 2004 has worsened this problem.

The largest project under construction, by far, is the Three Gorges Dam, which, when fully completed in 2009, will include 26 separate 700-MW generators, for a total of 18.2 GW. Plans were announced in March 2002 to reorganize the Three Gorges project into the China Yangtze Three Gorges Electric Power Corporation. The reservoir created by the dam began to fill in June 2003, and it began operating its initial turbines in July 2003.

Another large hydropower project involves a series of dams on the upper portion of the Yellow River. Shaanxi, Qinghai, and Gansu provinces have joined to create the Yellow River Hydroelectric Development Corporation, with plans for the eventual construction of 25 generating stations with a combined installed capacity of 15.8 GW.

Many of the major developments taking place in the Chinese electricity sector recently involve nuclear power. China's total installed capacity for nuclear power generation increased from 2.1 GW at the beginning of 2002 to 8.7 GW as of June 2004. The first generation unit of the Lingao nuclear power plant in Guangdong province began commercial operation in May 2002, with a capacity of 1-GW. The second 1-GW generating unit began operating in January 2003. An additional 600-MW generating unit at the Qinshan nuclear power plant in Zhejiang province began operation in February 2002, and another 600-MW unit at the same site came online in December 2002. A new 6-GW nuclear complex is planned for construction at Yangjiang in Guangdong province, to begin commercial operation in 2010. A second generating facility also is planned for Daya Bay.

A major issue for China's electric power industry is the distribution of generation among power plants. China's stated intention eventually is to create a unified national power grid, and to have a modern power market in which plants sell power to the grid at market-determined rates. In the short term, though, traditional arrangements still hold sway, and state-owned power plants which have government connections tend to have a higher priority than independent private plants. Additionally, some private plants with "take-or-pay" contracts, which provide for guaranteed minimum sales amounts, have had trouble getting the provincial authorities running the local grids to honor those terms. In the short term, the strong growth in electricity demand in 2003-2004 has lessened this problem.

Growth in Chinese electricity consumption is projected at an average of 4.3% per year through 2025. The largest future growth in terms of fuel share in the future is expected to be natural gas, due largely to environmental concerns in China's rapidly industrializing coastal provinces, though the largest increase in absolute terms is likely to be coal. If a truly competitive market for electric power develops as planned, the Chinese market may once again become attractive to foreign investment. At present, foreign direct investment is allowed only in power generation, but loan financing has been obtained for some power transmission projects.

The Chinese government is in the early stages of formulating a fundamental long-term restructuring of their electric power sector, embodied in the National Power Industry Framework Reform Plan promulgated by the State Council in April 2002. As with many other countries reform programs, generating assets are being largely separated from transmission and distribution. The State Power Corporation (SPC) divested most of its generating assets and was split into 11 regional transmission and distribution companies in December 2002. Electricity prices will still be regulated, but there are likely to be major changes in tariffs and the overall regulatory structure for electricity pricing. The process is at an early stage, and many of the details remain to be worked out. A new electricity law, superseding the one established in 1995, is expected to be promulgated within the next year.

Environment.

China suffers from major energy-related environmental problems. According to a report by the World Health Organization (WHO), seven of the world's ten most polluted cities are in China. The country's heavy use of unwashed coal leads to large emissions of sulfur dioxide and particulate matter. China also is important to

any effort to curb emissions of greenhouse gases, as it is projected to experience the largest absolute growth in carbon dioxide emissions between now and the year 2020.

China is a non-Annex I country under the United Nations Framework Convention on Climate Change, meaning that it has not agreed to binding targets for reduction of carbon dioxide emissions under the Kyoto Protocol. While the Chinese government is concerned with its environmental problems, it tends to be more concerned with local problems, such as particulate matter and sulfur dioxide emissions. Thus, it is undertaking efforts to lessen emissions of pollutants such as sulfur dioxide and nitrogen oxide, through improved pollution controls on power plants as well as policies designed to increase the share of natural gas in the country's fuel mix, particularly around major metropolitan areas.

Most importantly, China is focused on the 2008 International Summer Olympics, to be held in Beijing. Very strong, dedicated and innovative anti-pollution efforts, including reforestation of city parks and restoration to officially-enforced high standards of cleanliness of public facilities -- have been notable.

Colossal Waste.

Meanwhile, China's power supply and grid haven't kept pace with demand, compounding the problems created by rising dependency on foreign oil. While power shortages and rationing have been common during recent summers, for the first time ever nine provinces in China are expecting outages this winter. "Energy could be an Achilles' heel of the government," says Scott Roberts, director of the China operations of Cambridge Energy Research Associates in Beijing. Adding to the burden -- and increasing the need for oil -- is a colossal amount of energy waste, thanks to primitive coal-mining techniques, loose building construction codes, and inefficient factories. "The Chinese spend three times as much as the world average on energy to produce \$1 of gross domestic product," says Wenran Jiang, an associate professor at the University of Alberta.

The Chinese know they have a problem, and Premier Wen Jiabao and former Shanghai Mayor Xu Kuangdi, who now heads the Chinese Academy of Engineering, have taken the lead. Last November, the all-powerful State Council issued the broad outlines of a new energy policy through 2020 that called for a "leapfrog strategy in the energy field." The aims include securing more supplies abroad, shifting away from China's fixation with coal, dramatically increasing the use of natural gas, building more hydro generators on the mainland's vast river networks, upgrading the electricity grid, and pushing for more solar and wind power resources.

The plan even calls for a major ramp-up in nuclear energy. Beijing wants to have nearly 40 reactors by 2020, up from nine today. So later this year, China is expected to accept bids for building four 1,000-megawatt pressurized water nuclear reactors. Foreign companies such as Westinghouse Electric of the U.S., Areva and Alstom of France, Mitsubishi of Japan, and Atomic Energy of Canada are all in hot pursuit. China is also handing out fat contracts for conventional power-plant deals, cleaner coal-burning technologies, and wind power. "Growth is happening in all fuel types," says John Rice, chief executive of GE Energy, which last year nailed about \$900 million in contracts to build turbines in China.

What comes through most clearly in this energy scramble, though, is a mounting Chinese obsession with securing -- and safeguarding -- sufficient oil supplies from around the world. Coal is too polluting to rely on exclusively, and even nuclear energy won't come to the rescue. The 30 new reactors, when up and running, will kick in only about 4% of the juice the country needs. Oil, meanwhile, fuels China's cars, buses, and trucks and keeps many of its industrial plants churning out goods.

So the clock is ticking on locking in an oil lifeline that will keep the nation's supergrowth on track. By 2025, China will probably import 75% of its crude -- nearly twice the percentage today -- and consume 10.6% of the world's oil, the U.S. Energy Dept. estimates. Although crude has fallen some from its recent \$55-a-barrel high, experts expect Chinese demand will help prop up prices for years to come. And the Chinese know just how vulnerable a country can be when its oil comes from somewhere else. In fact, the military has published a book, called *Liberating Taiwan*, that imagines Chinese warships seizing sea routes to the Persian Gulf and imposing an oil embargo on Taipei, Tokyo, and Washington.

Beijing wants no such energy cutoff for the mainland. So the Chinese are grabbing what they can -- and fending off anyone with a rival claim. The result is a very muscular petrodplomacy. Look at what's happening to the Chunxiao natural gas field, which lies largely in Chinese territorial waters on a continental shelf in the East China Sea. Japan says part of the shelf juts into its maritime border extending from the southern island of Okinawa, so Tokyo -- also eager for energy -- wants its share of the bounty. Too bad: Beijing argues it controls the whole thing. A Chinese exploration group has started drilling there, and plans are being drawn up for a pipeline to spirit the stuff back to the mainland. The two sides attempted to smooth things over in meetings in Beijing on Oct. 26, but they got nowhere. "I don't know why these talks were even held," fumed Japan's Economic Trade & Industry Minister, Shoichi Nakagawa.

Japan and China are also clashing over the route of a pipeline across the dark forests and frozen steppes of Siberia. Tokyo wants Russia to build a pipeline costing as much as \$16 billion to the Pacific port of Nakhodka, where the oil could be transferred to tankers and shipped to Japan and other markets. Beijing is seeking a shorter route that would terminate in the Chinese oil town of Daqing. Chinese leaders have bent over backward to outfox Japan and in October even settled a long-standing border dispute with Moscow and promised some \$12 billion in business investment in Russia. Yet it's almost certain that Japan will triumph because a security-obsessed China insists on having full control of the end of the pipeline, and thus Russian oil supplies, within its borders. This Chinese solution would give the Russians zero flexibility in selling their oil to other customers. "It's like being tied to someone during a knife-fight," says Ronald Smith, an oil-and-gas analyst at Renaissance Capital in Moscow. Beijing might ultimately accept a pipeline to Nakhodka with a spur to China. That would be far costlier, though, and there are questions whether Russia can produce enough oil to make such a plan viable.

With the Russian pipeline far from a sure thing, China is looking elsewhere. Chinese companies have signed oil or natural gas exploration deals in Australia, Indonesia, Iran, Kazakhstan, Nigeria, Papua New Guinea and Sudan. So far, these deals represent just 10% of China's oil imports. Even so, China says they're important. "China has to look at supply security," says Mark Qiu, chief financial officer of offshore exploration company CNOOC Ltd., "and the name of the game in energy security is diversification."

Can Western companies profit from China's oil obsession? Beijing has for several years pushed for listings of its big oil companies on international markets in order to cement tie-ins with overseas energy producers. The 2000 initial public offering of PetroChina Co., a unit of China National Petroleum Corp., raised about \$3 billion globally, and BP PLC quickly snapped up 20% of the shares offered -- though it sold its stake this year. In later offerings, ExxonMobil and Royal Dutch/Shell bought pieces of Sinopec, the nation's refining and distribution giant, and Shell took a stake in CNOOC Ltd.

"Iffy Reserves"

Initially, the deals looked like a win for both sides. Chinese players would get foreign capital and exploration knowhow to nail new energy reserves, while the Western petromajors would get a foothold in the world's fastest-growing energy market. It hasn't worked out that way. This year, Western companies have pulled out of two projects that are critical to China's energy security: the Chunxiao gas development and the West-East pipeline, a \$6 billion project running from the western province of Xinjiang to Shanghai. Part of the problem is that the reserves in both Xinjiang and the East Sea are iffy, something even Chinese oil executives concede. Another is that there is little economic incentive for the Western oil majors to foot big upfront investments when Beijing has been slow in handing out domestic contracts to foreign players. True, there has been some progress: BP is a 30% partner in a Chinese joint venture to build a \$665 million liquid natural gas terminal and storage facility in Guangdong province and runs several hundred gas stations there, while Shell has set up a joint venture with Sinopec to build and operate 500 service stations in Jiangsu province. But Shell was an early participant in the West-East pipeline, only to pull out later. The company says that was for commercial reasons, but others say the benefits of the project would have flown to PetroChina, and that Shell had been denied access to the Chinese market for its own imported gas, as it had hoped when it signed on. "All these firms looked at the West-East gas pipeline as a gateway project," says Cambridge

Energy's Roberts. "They wanted to leverage the project for political capital that would win them access to other deals."

To its credit, China is allowing foreigners into the crucial field of controlling pollution. Coal continues to be the source of 70% of the nation's energy. Many homes still heat with coal, and the mainland's inefficient power industry is a major polluter and often burns unwashed, high-sulfur coal that spews tons of sulfur dioxide into the atmosphere. China is years behind in adopting cleaner coal-burning technologies such as scrubbers that trap pollutants before they can escape into the air. Last year, the Asian Development Bank found that just 5% of China's power plants had any serious pollution controls at all.

So China is letting foreign companies that specialize in cleaner-burning techniques, such as turning coal into gas or liquid fuel, start the cleanup. It's a vast project. China leads the global league tables in sulphur dioxide emission and is home to 16 of the 20 most polluted cities in the world, while cases of respiratory disease are surging. The World Bank estimates that pollution costs China about \$170 billion a year, or 12% of gross domestic product, in lost productivity and health-care costs.

Beijing leaders acknowledge such problems, although they argue it is an inevitable side effect of rapid industrialization that once also bedeviled other regional economies such as Japan. But the Chinese have begun experimenting with an emissions-trading market similar to those in the U.S. and Europe, in which permissible levels of pollution are established and enterprises that can't meet those targets can buy credits from greener companies. China also surprised critics in July by mandating some of the toughest auto-emission standards going.

That's encouraging, but it's only one part of the puzzle. It will take a sustained campaign of conservation, improved energy technologies, more enlightened treatment of Western oil partners, billions in investment, and loads of exploration luck at home and abroad for China to be truly energy secure. For the sake of its future prosperity, China needs to start getting a lot of things right -- and quickly.

SOUTH KOREA

The Republic of Korea (South Korea) is important to world energy markets as the fifth largest oil importer, and the second largest importer of Liquefied Natural Gas (LNG).

In South Korea, oil consumption rose during the past two decades at an average rate that was among the highest in the world. The projected growth rate in energy use will slow down markedly over the 2000-2020 period, as the Korean transportation sector reaches saturation levels. Nonetheless, South Korea oil demand is expected to add 1.2 million barrels per day to world oil demand in the forecast period, only slightly less than that of Western Europe. South Korea's only significant indigenous source of energy is coal.

After posting real growth in gross domestic product (GDP) of 4.6 percent for 2004, South Korea's economy is forecast to grow by 4.3 percent in 2005. While it has partially recovered from the brief recession of early 2003, growth in demand for the country's exports has remained slow. The 2003 recession was caused mainly by a consumer credit crisis, with a subsequent tightening of lending requirements and slowdown in household spending.

In response to the slow growth rate, the Bank of Korea has been pursuing an expansionary monetary policy. While inflation has risen modestly over the last year, the Bank cut interest rates twice in 2004 -- in August and in again in November. The rate cuts have curtailed the appreciation of the South Korean won against other currencies, which is intended to prevent an erosion of demand for South Korean exports.

In the wake of the Asian financial crisis of 1997-98, South Korea began an economic reform program designed to address some of the conditions which made its economy vulnerable. Most importantly, the South Korean government has begun to break the hold of the chaebols (large, multi-industry conglomerates) over

the financial sector. The lack of an “arms length” business relationship between borrowers and lenders had led to many South Korean financial institutions having a very large ratio of non-performing loans. While there is no intention of forcing the chaebols to divest their financial subsidiaries, the government has increased regulation to prevent chaebols from arbitrarily channeling money into other subsidiaries. Chaebols also have been pressed to spin off their non-core businesses and to rationalize their corporate structures.

The South Korean government has plans to privatize several large state-owned enterprises (SOEs), including the state electricity utility, Korean Electric Power Corporation (KEPCO), and the natural gas monopoly Korea Gas Company (KOGAS). The privatization program has moved at a slower pace than originally planned, due in part to strong opposition from labor unions to some of the privatizations and delays in passing implementing legislation. The South Korean government decided in June 2004 to limit the privatization of the electric power sector to generation facilities, retaining ownership over the transmission and distribution assets of KEPCO.

Oil.

With no domestic oil reserves, South Korea must import all of its crude oil. Oil makes up the largest share of South Korea’s total energy consumption, though its share has been declining gradually in recent years. Petroleum accounted for 54 percent of South Korea’s primary energy consumption in 2002. In 2004, the country consumed around 2.14 million barrels a day (bbl/d) of oil, down from a high of nearly 2.3 million bbl/d in 1997, all of which was imported. Demand has fluctuated very little since 2000. South Korea is the seventh largest oil consumer and fifth largest net oil importer in the world. Most of South Korea’s oil imports come from the Persian Gulf region, with Saudi Arabia supplying about one-third of the country’s import requirements in 2004.

South Korea’s total reliance on oil imports has led to a policy of securing and diversifying the country’s oil supply. South Korea has both a short-term and a long-term approach to fulfilling its oil needs. In the short-term, it has developed a strategic petroleum reserve, which is managed by the state-owned Korea National Oil Corporation (KNOC). Strategic stocks are roughly equivalent to a 90-day supply. The period of “import cover” was expanded from 60 days in early 2001, in part to meet the requirements for entry into the IEA. This reserve serves as a safety net against supply disruptions.

In addition to LNG imports, South Korea began producing a small amount of domestic natural gas in November 2003. KNOC’s \$320 million Donghae-1 development project is developing a natural gas deposit offshore from Ulchin in southeastern South Korea estimated to contain 240 Bcf of reserves. Donghae-1 is a relatively minor development, however, and will satisfy only about 2 percent of South Korea’s natural gas demand.

Meanwhile, South Korea also is exploring the possibility of a natural gas pipeline from the Kovykta natural gas deposit in the Irkutsk region of Eastern Siberia. The pipeline would supply China as well as South Korea. The project as currently envisioned would supply about 1 Bcf/d to South Korea, and a larger volume to China. The two Koreas agreed in September 2001 to conduct a joint feasibility study of the pipeline project, which was approved by the companies backing the project in November 2003. It now appears that the route will include a subsea section between China and South Korea, bypassing North Korea. No final decision or binding contract has been concluded for the project, which remains under negotiation.

Coal.

Coal supplies about 21 percent of South Korea’s total energy requirements. Most of this coal is imported, since the only indigenous coal resources consist of low-quality anthracite used in home heating and small boilers. Bituminous coal supplies (steam coal for power plants and industrial boilers and metallurgical coal for steelmaking) come mainly from Australia and China, with the United States also among the suppliers. State power company KEPCO has invested in several Australian coal mines. Increased demand for coal in China

in 2004 led to a drop in Chinese exports, which raised prices sharply for Pacific Basin coal importers, including South Korea.

Electric Power.

South Korea uses a combination of thermal (oil, gas, and coal), nuclear, and hydroelectric capacity to meet its demand for electric power. Total power generation capacity was 54 gigawatts (GW) as of the beginning of 2002. The South Korean government estimates that its electricity demand will rise at an average annual rate of around 4 percent per year through 2015.

In September 1998, KEPCO officially dedicated its Ulchin Number 3 nuclear reactor and launched the construction of Ulchin Nuclear Power Plants Numbers 5 and 6. Ulchin Number 3 has a generating capacity of 1 GW and is the first nuclear power plant built completely with South Korean technology from design to construction. The Number 4 Ulchin nuclear plant was completed in late 1999, and Number 5 was completed in mid-2004. Number 6 scheduled for completion in 2005.

The South Korean government is moving ahead with plans to break up and privatize most of the assets of KEPCO, albeit at a much slower pace than originally planned, and with electricity distribution being retained as a government-held corporation. The plan to retain distribution assets of KEPCO represented a change in policy, and was announced in July 2004. The South Korean government unbundled KEPCO into separate generation, transmission, and distribution units. In early 2001, KEPCO split its power generation holdings into six separate subsidiaries, in a preliminary move to facilitate a split into competing companies. Five of the six operate thermal and hydroelectric facilities and are of roughly equal size in terms of installed generating capacity - between 7 and 8 GW. The sixth is comprised of all of KEPCO's nuclear plants, which will be kept together in one corporation under government ownership. The privatization plan has been controversial, with unions fearing layoffs by new management and some politicians opposing foreign ownership. South Korea's government remains committed to privatization of the five non-nuclear generating companies, but progress has been slow, and dates for share offerings of the companies have been repeatedly postponed.

While most of South Korea's generating capacity is still controlled by KEPCO, a few independent power producers (IPPs) exist. LG Power, owned by the LG Group conglomerate, operates a 540-megawatt (MW) independent power plant at Bugok near Asan Bay. The facility began operation in April 2001. LG Power purchased the existing Anyang and Puchon plants in June 2000, with a combined capacity of 950 MW, from KEPCO after a competitive tender. Tractebel is also investing in a new 519-MW IPP plant in Yulchon in partnership with Hyundai. In another significant development, South Korea's original IPP, Hanwha Energy was spun off from its chaebol parent company in June 2000, in a deal in which El Paso Energy acquired a 50 percent stake. Hanwha Energy operates a 1,800-MW plant at Incheon. In general, IPP project activity has been slowed down by the uncertainty over the timetable for the privatization of KEPCO's generation assets.

South Korea has ratified the Kyoto Protocol on greenhouse gas emissions, and while its status as a "non-Annex I state" means it has not undertaken to meet specific targets, its future plans emphasize the development of more nuclear power plants to reduce growth in carbon emissions. A dozen additional nuclear plants are planned before 2015, which would raise the nuclear share of power generation in South Korea substantially.

Environment.

South Korea's rapid growth has resulted in significant environmental side effects, as industrial emissions from factories have caused serious acid rain problems. Increased car ownership also has led to a corresponding rise in carbon emissions from the country's transportation sector, contributing to South Korea's air pollution problems. Transboundary pollution is a major concern in the region, leading environmental ministers from South Korea, China and Japan to establish a joint commission to attempt to tackle the problem.

Thus far, there has been little emphasis on the development of renewable energy resources in South Korea, but that is changing as the 1997-1998 financial crisis focused attention on South Korea's dependence on imported oil to meet domestic energy demand. One of the country's stated goals in its National Vision for Environmental Policies in the 21st Century' is the promotion of green development schemes such as increased usage of photovoltaic power and fuel cells. South Korea's environmental outlook depends on its ability to shift its energy supply mix to cleaner-burning fuels and de-link the increase in carbon emissions from economic growth.

INDIA

The Republic of India (India), the world's sixth largest energy consumer, plans major energy infrastructure investments to keep up with increasing demand--particularly for electric power. India also is the world's third-largest producer of coal, and relies on coal for more than half of its total energy needs.

India's economic growth is continuing its recovery from a slowdown that took place in 2002, which was mainly attributable to weak demand for manufactured exports and the effects of a drought on agricultural output. Real growth in the country's gross domestic product (GDP) was 4.0% for 2002, surging to 8.2% in 2003 and a projected 6.4% for 2004 and 6.2% for 2005 (the Indian fiscal year for economic statistics begins on April 1.) In addition to strong economic growth, India has made substantial progress toward a reduction of political tensions with Pakistan, restoring trade and travel links, and resuming high-level contacts between the two governments.

After many years of pursuing economic policies based on import substitution and state ownership of key industries, India's government embarked on a series of economic reforms in the mid-1990s. The reforms included a relaxation of restrictions on foreign ownership in some sectors, and privatization of some industrial enterprises. After the most recent parliamentary elections, which took place in April and May 2004, a new government led by the Congress party was sworn in under the leadership of Prime Minister Manmohan Singh. While the new government has taken some symbolic steps away from the economic policies of the previous Bharatiya Janata Party (BJP)-led government, such as abolishing the Ministry of Disinvestment, the process of economic reforms is expected to continue, but possibly at a slower pace. In the energy sector, the largest impact has been the abandonment of full privatization of the state-owned petroleum sector, while reforms in the electric utilities sector under the Electricity Act of 2003 are continuing.

India has implemented a series of policy changes since the mid-1990s to encourage foreign investment. Tariffs on imported capital goods have been lowered, and in some cases eliminated (such as equipment for large scale power generation projects). Restrictions on foreign ownership have been relaxed, though there has been discussion of reinstating a few of them in key sectors. Previously, foreign ownership usually had been limited to a minority ownership stake. Annual foreign direct investment (FDI) in India has hovered in the range of \$3-\$5 billion over the last several years, compared to roughly \$40-\$50 billion per year of FDI in China.

India has had a longstanding territorial dispute with Pakistan over the ownership of Kashmir, which has led to a tense relationship between the two countries since the partition of British India in 1947. After a large-scale mobilization of military forces along their border during most of 2002, tensions eased somewhat late in the year, and both sides pulled back most of their forces from the border in phased withdrawals during 2003. Further confidence-building measures on both sides have taken place since then, and a nuclear "hotline" between the two governments is planned. India's rivalry with Pakistan has direct relevance to the country's energy sector, as it impedes plans for regional natural gas and/or oil pipelines (i.e., from Iran or Central Asia).

Oil.

Oil accounts for about 30% of India's total energy consumption. The majority of India's roughly 5.4 billion barrels in oil reserves are located in the Mumbai High, Upper Assam, Cambay, Krishna-Godavari, and Cauvery basins. The offshore Mumbai High field is by far India's largest producing field, with current output of around 260,000 barrels per day (bbl/d). India's average oil production level (total liquids) for 2003 was 819,000 bbl/d, of which 660,000 bbl/d was crude oil. India had net oil imports of over 1.4 million bbl/d in 2003.

Future oil consumption in India is expected to grow rapidly, to 2.8 million bbl/d by 2010, from 2.2 million bbl/d in 2003. India is attempting to limit its dependence on oil imports somewhat by expanding domestic exploration and production. To this end, the Indian government is pursuing the New Exploration Licensing Policy (NELP), first announced in 1997, which permits foreign involvement in exploration, an activity long restricted to Indian state-owned firms. While the initial response to the 1999 tender was disappointing, with no bids received from the major multinational oil companies (causing an extension of the deadline for submission of bids), India proceeded with the award of 25 oil exploration blocks in early January 2000. The largest winner in the bidding round was India's domestic Reliance Industries, in partnership with independent Niko Resources of Canada, which received 12 blocks. British independent Cairn Energy, Russia's Gazprom, the U.S. firm Mosbacher Energy, and Geopetrol of France were all awarded single blocks in partnership with Indian firms. India's state-owned Oil and Natural Gas Corporation (ONGC) was awarded eight blocks, three of which it will hold in partnership with other public-sector Indian firms. A second round of bidding, with a total of 25 blocks offered, concluded in March 2001. Sixteen of the blocks have been awarded to ONGC, and four blocks to Hardy Oil of the United Kingdom, in partnership with India's Reliance Petroleum. The others were either awarded to smaller independent firms or failed to receive bids. As with the first round, no bids were received from major international oil companies. Bids for the third round were received in August 2002, with a total of 27 blocks offered. Awards under this third round were made in February 2003, with domestic Indian firms receiving most of the blocks. Reliance Industries received nine offshore blocks, one adjacent to the Krishna-Godavari Basin. ONGC was awarded 13 blocks, five offshore and eight onshore. The Gujarat State Petroleum Corporation received one. Blocks offered during the fourth round in 2003 received relatively little foreign interest. Awards for 15 blocks were made in February 2004, with 14 going to ONGC and one going to Reliance Industries. A sixth round of bidding opened in August 2004.

Low drilling recovery rates are a major part of the oil supply problem for India. Historically, recovery rates have averaged only around 30% in currently producing Indian oilfields, well below the world average. It is hoped that allowing foreign investment will bring in technology that is not available to Indian state firms, thereby increasing overall recovery rates. ONGC currently is undertaking a project to increase recovery rates in the Bombay High offshore field and several others as well, aiming to boost the overall recovery rate for its production assets from 28% to 40%.

One area which has shown promise is western Rajasthan. Cairn Energy (UK) has been drilling in the area since 2001, and has reported several successful wells in 2004. The Mangala field has been estimated to contain as much as 320 million barrels of recoverable reserves, and the "N-A" field has estimated recoverable reserves of 80 million barrels. Cairn is continuing exploration in the area, and is planning to bring the field into production by 2007, with an expected volume of 60,000 to 100,000 bbl/d.

In February 2002, BG purchased a 30% stake in the Panna, Mukta, and Tapti offshore oil and gas fields, which had previously been held by Enron. A dispute between BG and ONGC (which owns a 40% interest in the fields) over which firm would operate them was resolved in February 2003 with a "joint operatorship agreement." Reliance Industries holds the other 30% stake.

Downstream/Refining.

For most of the 1990s, India imported a large quantity of refined products, lacking the refining capacity to keep up with growing demand. In 1999, refinery construction allowed India to close the gap. At the end of

2003, India had a total of 2.1 million bbl/d in refining capacity, an increase of 970,000 bbl/d since 1998. The largest single addition was Reliance Petroleum's huge Jamnagar refinery, which began operation in 1999. It has since reached its full capacity of 540,000 bbl/d. Jamnagar sells its products through three of the state-owned firms, and is in the process of building a retail network of its own, which is expected to include 2,000 retail outlets by the end of 2005.

Another major downstream infrastructure development is the construction of pipelines being undertaken by Petronet India, a company created by an agreement in 1998 between India's state-owned refineries. This construction is expected to add 500,000 bbl/d to India's current 325,000 bbl/d capacity for pipeline transportation of refined products. Pipelines between refineries and major urban centers are replacing rail cars as the main mode of transportation in India.

While state firms still control retail gasoline sales, several multinationals have entered the Indian lubricants market, which was deregulated five years ago. Firms such as Shell, ExxonMobil, and Caltex currently hold over one-third of the market. While these operations are relatively small, they are seen as allowing the majors to study the Indian market, establish brand recognition, and prepare for the eventual deregulation of the Indian retail petroleum products sector. Still, a requirement that foreign firms invest at least \$400 million before entering the downstream market has served to limit their entry into petroleum products retailing. Shell met this requirement in early 2004, and intends to open a few retail outlets beginning in 2005.

Industry Restructuring and Price Deregulation.

The Indian government officially ended the Administered Pricing Mechanism (APM) for petroleum product prices in April 2002. Prior to this deregulation, the Indian government had tried to offset the effects of price changes in crude oil by maintaining an Oil Pool Account, which was to build financial reserves when crude oil prices fell and release them back as increased subsidies when crude oil prices rose. In practice, though, the April 2002 reforms have not completely removed government influence on petroleum product prices. Subsidies have been maintained on some products, such as kerosene, which is commonly used as a cooking fuel by low-income households in India. State-owned downstream companies also still must submit proposed price changes to the Ministry of Petroleum and Natural Gas for approval. This has, in practice, limited movements in retail prices in response to fluctuations in world oil prices.

The previously planned sell-off of government stakes in Hindustan Petroleum (HPCL) and Bharat Petroleum (BPCL) appear unlikely to move forward in the near future. The policy of the new Congress-led government is to avoid most further privatizations of public companies which are making a profit. The new Congress-led government has reportedly been considering a restructuring of state-owned assets in the petroleum sector, which would consolidate IOC, ONGC, HPCL, and BPCL into two vertically-integrated major oil companies. No final decision has yet been made on such a restructuring.

India is planning to set up a strategic petroleum reserve equal to 15 days of the country's oil consumption. The state-owned refiner Indian Oil Corporation (IOC) is likely to take the lead in the development of the reserve, which would be paid for by the Indian central government by means of a tax on petroleum product sales.

Natural Gas.

Indian consumption of natural gas has risen faster than any other fuel in recent years. From only 0.6 trillion cubic feet (Tcf) per year in 1995, natural gas use was nearly 0.9 Tcf in 2002 and is projected to reach 1.2 Tcf in 2010 and 1.6 Tcf in 2015. A major development in December 2002 was the announcement by Reliance Industries of its discovery of a large amount of natural gas in the Krishna-Godavari Basin offshore from Andhra Pradesh along India's southeast coast. New reserves from this find are estimated at about 7 Tcf. Reliance reported another find offshore from Orissa in June 2004, with estimated reserves of 1 Tcf. Cairn Energy also reported natural gas finds in late 2002 offshore from Andhra Pradesh as well as Gujarat, which

contain reserves estimated at nearly 2 Tcf. The main market impacts from the new finds will be on India's east coast, which currently lacks extensive natural gas infrastructure.

Even with these new reserves, India's domestic natural gas supply is not likely to keep pace with demand, and the country will have to import much of its natural gas, either via pipeline or as liquefied natural gas (LNG). While EIA's current forecast in the "International Energy Outlook 2004" predicts a 4.8% annual growth rate in natural gas consumption, this reflects a substantial downward revision from previous forecasts, which had projected consumption of as much as 2.7 Tcf per year by 2010. Problems with financing LNG import projects have dimmed some of the previous prospects for explosive growth in natural gas consumption in India, and helped to revive interest in pipeline import options. Financial problems in the power sector, the main consumer of natural gas, also have had a negative effect.

Most of India's current natural gas production takes place in the Mumbai High basin and the state of Gujarat. Current projects include enhancing natural gas production at the Tapti fields in Gujarat and recovering previously flared natural gas at the Mumbai High oilfield.

India is investing heavily in the infrastructure required to support increased use of natural gas. Gas Authority of India Limited (GAIL), a government-owned entity, is in the process of doubling the throughput capacity on its main Hazira-Bijaipur-Jagdishpur (HBJ) Pipeline. Work on the capacity expansion began in 2002, and will eventually raise the capacity of the line from about 1.1 billion cubic feet per day (Bcf/d) to 2.1 Bcf/d. GAIL also plans a new distribution network in West Bengal and a pipeline which would connect Calcutta with Chennai. Shell has signed a memorandum of understanding with the state government of Uttar Pradesh in northern India for the development of a natural gas distribution infrastructure.

India's Foreign Investment Promotion Board (FIPB) had approved 12 prospective LNG import terminal projects in the mid-to-late-1990s, but it was never considered likely that all would be built in the near future, as their combined capacity would have exceeded even the most optimistic demand projections. The Indian government froze approvals of new LNG terminals in 2001, and payment problems at the Enron-backed Dabhol Power Plant in Maharashtra led many to question the financial viability of some of the LNG import projects. Reforms currently being undertaken in the electric power sector may eventually change this situation.

The largest state sector projects are to be conducted by Petronet, a joint venture between ONGC, IOC, the Gas Authority of India Ltd. (GAIL), the National Thermal Power Corporation (NTPC), and Gaz de France. Each of the state firms owns a 12.5% stake, the Gujarat state government owns a 5% stake, and the rest is owned by private investors, including a 10% stake held by Gaz de France. Petronet plans two import terminals, one at Dahej and the other at Cochin. The import terminal at Dahej began operation earlier this year, receiving India's first cargo of LNG on January 30, 2004. The Dahej terminal had major advantages over some of the other proposed projects, because it is tied in with the main state-owned natural gas company, GAIL, and the existing HBJ pipeline network. Petronet is scheduled to start construction on its second terminal, at Kochi in Kerala state, in late 2005. Shell also has begun construction of its LNG import terminal at Hazira in Gujarat, and has contracted for LNG supplies from Oman. The facility was scheduled to begin operation in November 2004. Like the Petronet Dahej terminal, it is to be linked into existing natural gas pipelines.

The Dabhol LNG terminal was nearly finished at the time construction was halted in June 2001, and it will likely be completed eventually, since construction was about 90% completed. Two American firms involved in the project, General Electric and Bechtel, purchased Enron's 65% stake in the project. At present, international arbitration is still pending over the financial terms of the project, mainly involving the government guarantees, and it is unclear when work on completing the facility will begin.

In the wake of the problems with Dabhol, firms backing several other LNG projects pulled out of India in the second half of 2001. Dhaksin Bharat Energy, a consortium including CMS Energy and Unocal, also announced the cancellation of its planned LNG project at Ennore. Total has suspended further action on its

planned LNG import terminal at Trombay. These LNG projects were cancelled largely in response to the Indian government's decision not to extend sovereign payment guarantees to power projects which were to have been among the import terminals' largest customers. Another proposed project in Andhra Pradesh on India's east coast may be jeopardized by cheaper natural gas supplies which will become available once Reliance Industries new offshore finds are developed. The BP-led consortium backing the project has switched the proposed location from Kakinada to Krishnapatnam, about 250 miles to the south.

Aside from LNG imports, imports of natural gas by pipeline may eventually play a role in satisfying India's gas needs. One possibility would supply India with natural gas from Iran's huge South Pars field via a pipeline, either subsea or through Pakistan. Iran has discussed the proposal with India and Pakistan. Australia's Broken Hill Proprietary (BHP) is the main foreign backer of the idea. An offshore route bypassing Pakistan also has been studied. Pakistan had said in early 2001 that it would allow supplies to cross its territory, and Iran would bear the contractual responsibility for assuring gas supplies to India. With the thaw in India-Pakistan relations over the last year, the idea is again gaining some interest. Supplies of LNG from Iran might also be an option in the future, and IOC has opened discussions with the National Iranian Oil Company (NIOC) on a possible LNG export deal.

Another possible import route would link the natural gas reserves of Bangladesh into the Indian gas grid. Current proven reserves of natural gas in Bangladesh are at least 14 Tcf, but the foreign firms involved in natural gas exploration in Bangladesh, which includes Unocal, believe that reserves are higher. Shell, which backs exports to India, has estimated Bangladeshi natural gas reserves at 38 Tcf, and a study by the U.S. Geological Survey put the country's probable reserves at 32 Tcf. Bangladesh has been reluctant to approve exports to India, however, until all questions about reserves and its domestic supply have been resolved. After years of delays, Unocal effectively shelved the project in March 2004.

Finally, a new natural gas find in Burma also has attracted interest as a potential source of supply for India. Indian companies ONGC and GAIL own a total of 30% equity in the reserves, and Bangladeshi officials stated in June 2004 that they would be willing to consider a pipeline running across Bangladeshi territory from Burma to West Bengal in India, provided agreement could be reached on terms and transit fees.

India's government has been considering reforms in its natural gas pricing mechanism, which is currently set by the government. Deregulation has been delayed several times, and buyers of natural gas from private sources such as the LNG terminal at Dahej pay prices much higher than those purchasing from the state-owned suppliers. With the shortage of natural gas and willingness of some consumers to pay more, deregulation would likely lead to higher prices if implemented.

Coal.

Coal is the dominant commercial fuel in India, satisfying more than half of India's energy demand. Power generation accounts for about 70% of India's coal consumption, followed by heavy industry. Coal consumption is projected to increase to 430 million short tons (Mmst) in 2010, up from 359 million short tons (Mmst) in 2000. India is the world's third largest coal producer (after China and the United States), so domestic supplies satisfy most of the country's coal demand. Indian coal generally has a high ash content and low calorific value, so most coking coal must be imported. Major Indian coal fields are found in Bihar, West Bengal, and Madhya Pradesh.

The Indian government controls almost all coal production, which has been plagued by low productivity, distribution problems, and an increasing loss of domestic market share to higher quality, less expensive imports. Nearly all of India's 390 mines are under Coal India Ltd. (CIL), which accounts for about 90% of the country's coal production. Current policy allows private mines only if they are "captive" operations which feed a power plant or factory. The current government has called off plans for further coal-sector liberalization in the face of strong opposition from labor unions.

Electricity.

India is trying to expand electric power generation capacity, as current generation is seriously below peak demand. Although about 80% of the population has access to electricity, power outages are common, and the unreliability of electricity supplies is severe enough to constitute a constraint on the country's overall economic development. The government had targeted capacity increases totaling 100,000 megawatts (MW) over the next ten years. As of January 2002, total installed Indian power generating capacity was 120,000 MW.

The drive to increase the country's generating capacity, along with the general trend toward economic liberalization in India in the 1990s, led to much interest among foreign investors in setting up Independent Power Producers (IPPs) in India. While dozens of projects were approved, most of the largest projects were stalled by delays in regulatory approvals and in some cases failure to secure adequate financing. India's state electricity boards (SEB's), which run the power distribution infrastructure and own most current generating capacity, are in very poor financial shape, with many of them technically insolvent. One reason is the sale of power at subsidized rates, which does not cover costs (particularly in the agricultural sector). Other problems include the high level of transmission and distribution losses and widespread power theft. Since the SEBs would be the main purchasers of power from IPP projects, resolving their financial problems is critical to attracting the capital necessary to ensure the country an adequate supply of electric power.

In July 1998, the Indian government announced an easing of rules related to foreign investment in the power sector. Proposals for investments up to 15 billion rupees (about \$350 million) involving up to 100% foreign equity now will be approved automatically. Such approval will be given for investments in generation or distribution from hydroelectric, coal, lignite, oil, or gas power plants, but not for nuclear plants and associated distribution networks. The earlier policy had allowed for only up to 74% foreign equity. Still, the financial problems of the SEBs have prevented substantial foreign investment from flowing into India's electric power sector.

From the mid-to-late 1990s, India's government approved a large number of "mega-projects," defined as plants with capacity of more than 1,000 MW for thermal plants and more than 500 MW for hydroelectric plants, from the mid-to-late-1990s, but project approvals have often not led to construction. The 740-MW initial phase of the Dabhol LNG-fired power plant began operation in May 1999, and Phase II, which would add 1,440-MW of capacity, is about 90% complete. Payment problems with the Maharashtra State Electricity Board (MSEB), however, prompted Enron-backed Dabhol Power Corporation (DPC) to serve notice of breach of contract on MSEB in May 2001. Construction on Phase II was halted in June 2001. General Electric and Bechtel have acquired Enron's 65% stake in the project adding to the 10% they each owned prior Enron's bankruptcy. International arbitration over the financial settlement of the Dabhol issue is pending, and it remains unclear when action will be taken to resume output of electricity and complete the construction of Phase II. Given that it is near completion, however, it is likely to be finished and operational at some point. The new Congress-led government has given additional high-level attention to resolving the Dabhol issue, constituting a "Group of Ministers" to meet regularly to coordinate policy.

Due to financial problems of the SEBs, a large number of foreign firms cancelled or delayed power generation projects in India between 1999 and 2001. Most new generating capacity in India in the last three years has been financed with domestic capital, or with the help of international financial institutions (IFIs) such as the Asian Development Bank (ADB). The Electricity Act of 2003 was designed to remedy many of the problems besetting India's power sector, and to attract capital back to large-scale power generation projects. The Act envisioned the unbundling of SEB assets into generation, transmission, and distribution companies, and the eventual privatization of these assets. Access is to be opened up to the SEBs transmission grids, allowing power producers to sell directly to large industrial consumers. Also included is a one-time financial bailout of the SEBs, which packaged their \$7 billion in debts to the federal-level National Thermal Power Corporation (NTPC) into bonds at concessionary interest rates. The new Congress-led government which took office in May 2004 remains committed to power sector reform, though

implementation of some aspects of the program may slow down. A June 2004 deadline for open access to transmission lines was delayed.

Environment.

The twin issues of population growth and urbanization present a major challenge to India's environment. A combination of increased vehicular ownership and untreated industrial smoke has created a hazardous air pollution problem in India's booming metropolises, and continued urbanization is raising the risks to human health. Several of India's largest cities are ranked among the most polluted in the world. An inability to implement and enforce policies geared to mitigate smog and other sources of air pollution has only exacerbated the problem.

Owing to population growth and economic development, India's energy consumption has been increasing at one of the fastest rates in the world. India's heavy reliance on coal has meant that the country's carbon emissions are rising at a similar rate. India is a non-Annex I country under the United Nations Framework Convention on Climate Change, meaning it is not obligated to reduce its emissions of carbon and greenhouse gases (GHG). Although India recognizes the importance of reducing these harmful emissions, the Indian government also places a high priority on its economic development, and India's carbon emissions are projected to continue to rise in the coming decade.

The industrial production that has driven India's economic growth has also prevented the country from lowering its energy intensity (energy consumption per dollar of gross domestic product, GDP), while continued dependence on coal for the purpose of electricity generation means that India has one of the highest levels of carbon intensity (carbon emissions per dollar of GDP) in Asia. The Indian government is increasingly turning to renewable energy, however, to meet the country's growing energy consumption needs. Despite government-promoted plans to increase the use of more environmentally-friendly energy sources like solar power and hydroelectricity, the environmental outlook for India looks negative unless Indian policymakers can tackle the problem of providing increasing amounts of energy to a rapidly growing populace in an environmentally-sustainable fashion.

Finally, leading the charge to find new oil and gas supplies is ONGC, with \$11 billion in annual revenues. Through subsidiary ONGC Videsh Ltd., the government has been scouring the world, acquiring stakes in existing oil fields, and securing the rights into the future. The strategy is to go to oil-rich countries where U.S. companies cannot go or to developing nations with which India has long-standing diplomatic ties. Thus, since 2001, ONGC Videsh has spent an estimated \$11 billion investing in 14 oil and natural gas projects in Sudan, Russia, Vietnam, Iran, Iraq, and Burma.

Everywhere it goes looking for petroleum, India is shadowed by China. It is sometimes outbid for oil concessions by China's three largest oil companies, which have more money to spend. So the Indian government is now starting to use its diplomatic clout. While bidding for a 20%, \$1.7 billion share in Sakhalin I, an offshore oil and natural gas field, in 2001, New Delhi exploited its 50-year-old diplomatic alliance with Russia to win the deal.

If good diplomacy makes good economics, it works the other way, too. The "peace pipeline" that is to run from Iran through Pakistan will cost billions but is expected to save India \$300 million a year in energy transport costs. Pakistan will get its transit fee, a share of the pipeline gas, plus the right to buy diesel fuel from India. Meanwhile, India also wants to trade Indian power for Bangladeshi gas, an energy swap that could serve to relieve border tensions. And Nepal has extra hydroelectric energy it could sell to its neighbors. The implications of the various proposed energy deals are vast, since they will connect South Asia to new road and power grids in Southeast Asia. "Once roads, an electricity grid, and a natural-gas pipeline are linked, India will be a welcome addition to ASEAN," says TERI's Srivastava, referring to the Association of Southeast Asian Nations. "It will really open up Asia."

Skeptics doubt that the energy linkups will do more than paper over long-standing enmities. Still, in India's case, neither the government nor the business establishment is willing to let a shortage of energy curb the country's rise as an economic power. Thus, whatever geopolitical obstacles may get in the way, the diplomacy of energy will continue.

JAPAN

Japan is the world's fourth largest energy consumer and second largest energy importer (after the United States). Over the past decade, Japan has been experiencing a period of slow economic growth, and has taken important steps towards economic deregulation and restructuring. Renewed economic growth in the last year, however, may lead to higher energy demand.

Japan's economic growth accelerated in 2004, continuing the recovery it began in 2003, following a decade of economic stagnation. Japan's real gross domestic product (GDP) rose by 2.5% in 2003, and was projected to rise by 4.5% in 2004 -- the fastest growth rate experienced by the Japanese economy in the last 14 years. The upturn largely reflects a surge in export demand, led by exports to China. Domestic consumer spending in Japan also has been strengthening this year. Unemployment has fallen to 4.6% down from a high of 5.5% in early 2003.

Japan's Prime Minister, Junichiro Koizumi, who took office in 2001, has pressed for structural reforms in Japan's economy. In one major change, Koizumi reversed the previous policy of increasing government spending to stimulate the country's economy, and has set a deficit ceiling of 30 trillion yen (\$270 billion). Spending on public works projects, which had been funded as part of previous stimulus packages, has been scaled back significantly. The Bank of Japan, however, has adopted a more expansionary monetary policy, which has provided some stimulus to the economy.

Japan's economic stagnation since the early 1990s led to a period of consolidation in the country's energy sector. Energy demand has been stable, and Japan's energy industries, particularly the downstream oil sector, underwent a period of downsizing and consolidation. Japan remains important to the world energy sector, though, as one of the major exporters of energy-sector capital equipment, as well as engineering, construction, and project management services.

Energy.

Japan lacks significant domestic sources of energy and must import substantial amounts of crude oil, natural gas, and other energy resources, including uranium for its nuclear power plants. In 2002, the country's dependence on fossil fuel imports for primary energy stood at more than 80%. Oil provided Japan with 49.7% of its total energy needs, coal 18.9%, nuclear power 13.7%, natural gas 12.7%, hydroelectric power 3.7%, and renewable sources 1.1%. About half of Japan's energy is used by industry and about one-fourth by transportation, with nearly all the rest used by the residential, agricultural, and service sectors. Japan's energy intensity (energy use per unit of GDP) is among the lowest in the developed world.

Oil.

Japan contains almost no oil reserves of its own (59 million barrels of proven oil reserves), but it is the world's third largest oil consumer (after the United States and China). Japan consumed an estimated 5.57 million barrels per day (bbl/d) of oil in 2003, up from 5.30 million bbl/d in 2002. Part of the increase in oil consumption was attributable to the shutdown of a large number of nuclear power plants in 2003, which caused utilities to maximize use of oil-fired generating capacity. Most (75%-80%) of this oil came from OPEC, particularly Persian Gulf countries such as the United Arab Emirates, Saudi Arabia, Kuwait, Qatar, and Iran. Japan has worked -- with relatively little success -- to diversify its oil import sources away from the Middle East. Until 1996, when Japan's oil consumption peaked at nearly 5.9 million bbl/d, Japanese oil consumption (and imports) had been growing steadily for years. From 1997 through 2002, Japan's oil

consumption declined as its economic slump caused demand by industrial and other users to decline. With nuclear electricity generating capacity restored, Japan's oil demand was judged likely to dip slightly in 2004, despite relatively strong economic growth.

Japanese oil companies have been active overseas since 1967, when the government established a state-run company to promote overseas oil exploration, the Japan National Oil Company (JNOC). Over the years, JNOC amassed numerous bad loans through extensive investment programs and loan guarantees to Japanese exploration firms. A study of JNOC for the Japanese Ministry of Economy Trade and Industry (METI), conducted by the American consulting firm Booz Allen and Hamilton, concluded that Japan's policy of subsidies for oil exploration left firms with little incentive to seek high rates of return on their investments. In November 2001, Prime Minister Koizumi called for the abolishment of JNOC, and the Japanese government has been planning its liquidation and considering what role it should have in financing overseas oil projects. Current plans call for the final dissolution of JNOC to take place by July 2005. A new company, however, would be formed out of three of the more financially-sound units of JNOC. One of the other major subsidiaries of JNOC, Japan Petroleum Exploration Corporation (Japex), was successfully listed on the Tokyo Stock Exchange in late 2003.

The loss of drilling rights by Japan's Arabian Oil Company (AOC) in the Saudi Arabian portion of the Neutral Zone dealt a major blow to Japan's policy of seeking overseas equity in oil projects. AOC's rights to the concession, which produced 280,000 bbl/d, expired at the end of February 2000. Efforts to negotiate an extension with Saudi authorities failed when Japan refused to commit to investment in development projects desired by the Saudis. Saudi Aramco has taken over operation of the former AOC fields. AOC's concession for the Kuwaiti portion of the Neutral Zone expired in January 2003. In December 2002, however, Kuwait signed a service contract with AOC, similar to those held by other foreign oil companies in Kuwait, allowing the firm to maintain its operations there. While AOC does not hold an equity stake in the field, its offtake from operations there is essentially unchanged, despite the change in contract terms.

Japan has been trying to make up for the loss of the AOC concession in Saudi Arabia by increasing its investment in Iran. Iran announced in November 2000 that it would begin exclusive negotiations with Japex and Indonesia Petroleum (Inpex) for development rights to the huge onshore Azadegan oilfield. Azadegan has been estimated to contain 6 billion barrels of recoverable reserves. The consortium submitted a preliminary development plan for Azadegan in mid-2001, and a binding contract for the project was concluded between the Japanese firms and the National Iranian Oil Company (NIOC) in February 2004. Initial production from Azadegan is expected by 2007, with peak production of 260,000 bbl/d reached by 2012.

Apart from its interests in the Persian Gulf, Japan also has been seeking equity stakes in the Caspian Sea region. In July 1998, Mitsui purchased a 15% share, along with Azerbaijan's State Oil Company, of concessions in the Caspian Sea's Kur Dashi oil field. Oil reserves in the contract area are estimated at 500 million-1 billion barrels. In February 1999, JNOC announced that it would help finance the oil development project, the first since it revealed its major financial difficulties in June 1998. The Kur Dashi oil field is important to Japan's strategic goal of reducing its dependence on Middle Eastern oil imports. In December 1998, four other Japanese companies (Japex, Teikoku Oil Co., Inpex, and Itochu Corporation) signed a deal to purchase a different field (Atashgyakh-Mugandeniz-Yanan Tava) in the Caspian. Inpex purchased a 7% stake in Kazakhstan's offshore Kashagan field in the Caspian Sea in 2000.

Another possible source for Japanese oil imports, which has recently received increased attention, is the Russian Far East. Japan has been promoting a proposed pipeline from oilfields near Anagarsk in Siberia to an export terminal on the Pacific coast at Nakhodka. An alternate proposed route would transport the oil from Anagarsk to Daqing in China, connecting to China's existing crude oil pipeline network. A Russian export terminal on the Pacific is a very appealing idea to Japan, since it could reduce Japan's dependence on imports from the Persian Gulf. As of mid-2004, it appeared likely that the Nakhodka pipeline option is more likely to be built, with Japan offering financing of as much as \$10 billion on favorable terms to promote its preferred pipeline route and upstream development.

Refining/Downstream.

As of January 2004, Japan had 4.7 million bbl/d of oil refining capacity at 32 refineries, down from 5.0 million bbl/d as recently as 2001. In recent years, as Japan's petroleum product consumption has stagnated, the country's refining industry has suffered from overcapacity. Japan also began to allow imports of petroleum products in the mid-1990s, putting additional pressure on Japanese refiners to cut costs and become internationally competitive.

In response to these pressures, Japan's refining industry went through a round of consolidations in 1999 and 2000. Nippon Oil and Mitsubishi Oil completed a merger in early 1999, forming Nippon Mitsubishi Oil. Nippon Mitsubishi then acquired Koa Oil from Caltex in September 1999, and in February 2002 merged Koa Oil with another subsidiary, Tohoku Oil. In October 1999, Nippon Mitsubishi announced a strategic alliance with another independent Japanese refiner, Cosmo Oil. The move, while not a merger, allows the two companies to coordinate distribution of refined products and to reduce costs through reduced duplication of some functions. Another similar strategic alliance was formed with Idemitsu Kosan in December 2002. As a result of the agreement, Idemitsu shut down the 80,000-bbl/d Hyogo refinery in April 2003 and its 110,000-bbl/d Okinawa refinery in November 2003.

A second alliance coalesced around Showa Shell, Royal Dutch Shell's Japanese subsidiary, in which it owns a 50% stake. In January 1999, Showa Shell and Japan Energy announced a strategic alliance in petroleum product distribution and crude oil procurement.

The third major player in Japan's refining sector is ExxonMobil, through its Japanese subsidiary, Tonen General Sekiyu, which resulted from the merger of two ExxonMobil subsidiaries in February 2000. Tonen is the third largest of the alliances in terms of market share.

Fuji Oil, which has a 200,000-bbl/d refinery near Tokyo, was acquired by AOC in January 2003. This created a vertically-integrated, albeit small, company based on AOC's crude oil imports from Kuwait's half of the Neutral Zone.

While many regulatory restrictions on Japanese refiners have been removed over the last few years, the firms remain saddled with a requirement to maintain mandatory large petroleum stocks. This requirement permits Japan to maintain a strategic reserve without having to build a government-run storage facility like the U.S. Strategic Petroleum Reserve, but also imposes significant additional capital costs on refiners operating in Japan.

Natural Gas.

Japan has about 1.4 trillion cubic feet (Tcf) in proven natural gas reserves, with possibly more under the seabed surrounding Japan. Because domestic natural gas production is minimal, about 97% of Japan's natural gas is imported, all in the form of liquefied natural gas (LNG). Unlike oil, demand for natural gas is still rising about 3-4% per year. Most of this LNG comes from Southeast Asia, with 28% from Indonesia, 20% from Malaysia, and 12% from Brunei. The United States also supplies a small quantity of LNG to Japan from a facility in Alaska, which accounts for slightly over 2% of Japan's natural gas consumption. Most of the LNG is used either for electric power generation or as feedstock for petrochemical plants.

Three Japanese companies, Tokyo Gas, Osaka Gas, and Toho Gas signed a binding contract in February 2002 for the import of natural gas from Malaysia's MLNG Tiga project, covering deliveries beginning in 2004. The contract is noteworthy in that it includes much more flexible terms for the purchaser than most traditional LNG contracts, which commit the purchaser to a specific volume over 15 to 20 years. The three firms also renewed their baseload contracts with Malaysia's first two LNG export terminals, on terms more flexible than the original contracts. Tokyo Gas and Toho Gas signed a binding contract in October 2001 for LNG purchases from Australia's North West Shelf LNG project, which began in 2004. Three Japanese companies,

Mitsubishi, Osaka Gas, and Itochu, signed contracts in June 2004 with Oman's Qalhat LNG for deliveries to begin between 2006 and 2009.

Many of Japan's existing LNG contracts date from the 1970s and 1980s, when terms were less flexible and tied to prices for crude oil. With these contracts coming up for renewal, Japanese buyers have been insisting terms more favorable to the buyer, including volume variances and a weakening in the pricing link to crude oil.

Japanese firms have been considering the possibility of imports, either by pipeline or as LNG, from large natural gas deposits on the Russian island of Sakhalin. ExxonMobil and Shell are backing rival development projects - ExxonMobil a project (Sakhalin-1) which would export natural gas via a pipeline to Japan's main island of Honshu, and Shell a project (Sakhalin-2) which would feed into an LNG export terminal with Japanese firms as its primary customers. Shell's Sakhalin-2 project has made faster progress, having signed contracts in the first half of 2003 with both Tokyo Electric Power (TEPCO) and Tokyo Gas, and in March 2004 with Toho Gas. Deliveries are set to begin in early 2007. ExxonMobil has said it doesn't expect the Japanese market to have sufficient demand for its pipeline project to begin deliveries as originally planned in 2008, and it is now studying other export options targeted at South Korea or China, while not having abandoned the concept of eventually building a pipeline to Japan.

Japan has objected to Chinese development of natural gas resources in the East China Sea in an area where the two countries Exclusive Economic Zone (EEZ) claims overlap. Japan claims a division of the EEZ on the median line between the countries' coastlines. China claims an EEZ extending to the limits of its continental shelf. The specific development in dispute is China's drilling in the Chunxiao field, which is three miles west of the median line, but which Japan contends may be tapping natural gas reserves which extend past the median line.

Much of Japan's urban area is not served by a natural gas distribution system and the country is considering expansion of its internal natural gas pipeline system. Many analysts cite the absence of an effective natural gas distribution system as a key reason for Japan's high retail energy prices.

City gas consumption has increased by more than 70% in the last decade due to a 25% increase in natural gas customers and also to a large rise in consumption by industry. Japan's major natural gas companies include Tokyo Gas, Osaka Gas and Chubu Gas. The Japanese government has begun to gradually deregulate the natural gas industry, which is leading to the increased competition.

Coal.

Japan has small coal reserves of 852 million short tons (Mmst), and the country ceased production in January 2002 with the closure of its last operating coal mine at Kushiro, on the northern island of Hokkaido. Japan's coal mines had been heavily subsidized in recent years, since they were not cost-competitive with other producers.

Japan is by far the world's largest importer of steam coal, mainly for power generation, paper plants, and cement production. Japan also is the world's largest importer of coking coal for its steel industry. Overall, Japan accounts for about 22% of total world coal imports. Sources of imported steam coal are Australia, South Africa, the United States, and China. Japanese coking coal imports come mainly from Australia, Canada, the United States and Russia.

Prices paid by Japanese firms for coal are currently rising, as decreased exports of coal from China put upward pressure on the market. Chinese exports expanded rapidly in 2002 and early 2003, pushing Asian coal prices down, but increased domestic demand reversed this trend in the second half of 2003.

Electricity.

Japan generated 1,044 billion kilowatthours (Bkwh) of electricity on 238 gigawatts of capacity in 2002. Of Japan's total generation in 2002, about 62% came from thermal (oil, gas, and coal) plants, 28% from nuclear reactors, 8% from hydroelectric dams, and less than 2% from geothermal, solar, and wind.

Due to the country's desire to enhance its energy security, Japan has increased its reliance on nuclear power generation. The last two years, however, have been challenging for Japan's nuclear power industry. In August 2002, evidence revealed that maintenance inspection findings at some nuclear reactors owned by Tokyo Electric Power (TEPCO) had not been properly reported to government regulators. This led to the shutdown of all 17 of TEPCO's nuclear reactors over the following several months. Several new reactor projects, including some proposed by other utilities, were put on hold while the issue was resolved. In the short term, this led to increases in Japan's fuel oil and LNG consumption, as generating capacity using fossil fuels was brought online to make up for the shortage of nuclear generating capacity. TEPCO has been gradually bringing its nuclear generating units back online, as they are re-licensed, and had 13 of the 17 units in operation as of the end of June 2004. All 17 units were returned to operation by September 2004.

By raising its reliance on nuclear-generated electricity, Japan is hoping to reduce its carbon dioxide emissions. Japan's current 10-year energy plan, approved in March 2002, calls for the expansion of nuclear generation by about 30% by 2011. This is expected to entail the construction of between 9 and 12 new nuclear power plants, with 17.5 GW in new nuclear generating capacity. The Japanese government also plans to offer subsidies for nuclear power plant construction, to offset expected cost-cutting pressures on utilities due to deregulation which might lead to increased reliance on fossil fuels for electricity generation. Currently Japan ranks third worldwide in installed nuclear capacity, behind the United States and France. Japan currently has 51 reactors with an installed capacity of 45 GW. Japan's government has indicated that it is still committed to increasing nuclear power's share of generating capacity in the future, but many independent analysts think that the target of a 41% nuclear share of electric power generation by 2011 is unlikely to be achieved. Public opposition to Japan's nuclear power program has increased in reaction to a series of accidents at Japanese nuclear plants, especially the accident at the Tokaimura uranium processing plant in September 1999, the 2002 TEPCO reactor shutdowns, and an August 2004 steam pipe burst at the Mihama nuclear power plant which killed four workers.

In August 1998, the Atomic Energy Commission approved the construction of a new light-water reactor, which will be built in Higashidori in Aomori prefecture in northern Japan. Also, in March 1999, the Japanese Nuclear Safety Commission approved plans for Hokuriku Electric Power Company to build a new nuclear power plant in the central town of Shika, which will be operational by 2006.

To enhance its energy security, Japan's government advocates uranium and plutonium recovery through reprocessing of spent fuel. The Power Reactor and Nuclear Fuel Development Corporation (PNC) operates a reprocessing plant with an annual capacity of 90 tons, but a larger reprocessing plant, Rokkasho-Mura, with a capacity of 800 tons per year, planned for completion in July 2005, is under construction. Reprocessing is expensive and costs can quickly rise with new safety requirements and the development of new technologies. Estimated in 1993 to cost about \$8 billion, more recent estimates put the cost of the facility much higher. In the meantime, Japan is negotiating with the French firm COGEMA for the reprocessing of spent nuclear fuel in France. COGEMA may continue to reprocess some spent fuel even after the Rokkasho plant is completed. Japan also is interested in recycling recovered plutonium. In 1999, Japan began -- in two prefectures -- a controversial mixed-oxide utilization plan, which involves burning a highly toxic mix of plutonium and uranium on a commercial scale.

Natural gas, mainly imported as LNG, also is likely to experience considerable growth as a fuel for electricity generation. Renewables, chiefly hydropower and geothermal energy, also are expected to grow, and both coal and nuclear are projected to grow in absolute terms (although nuclear power's share of the market is expected to drop). An accelerating decline is projected for oil-fired generation, which is still more significant in Japan than in most other developed countries. Japan's economic slowdown had resulted in a sharp

downturn in capital spending by utilities, which has delayed several new power plant projects, but the recent upturn in the country's economic growth may lead to increased electric power demand.

Japan's electricity prices are by far the highest in the OECD, and Japan has begun a program of reforms designed to make its electric utility sector more efficient. Currently, Japan is served by 10 vertically integrated utilities which each have a specific geographic zone. The Japanese Diet passed a bill in May 1999 which amended the Electric Utilities Industry Law (EUIL) to allow a partial opening to competition. Beginning in March 2000, about 8,000 large industrial and commercial Japanese electric power consumers, comprising roughly one-third of the Japanese power market, have been able to choose their electricity suppliers. Regional utilities currently are obligated to allow power from other suppliers to transit their grids to these large consumers. In April 2005, an additional phase of deregulation was expected to take effect, which will extend competition to all industrial and commercial entities with peak demand over 50 kilowatts.

While a small percentage of Japan's electricity has been provided by independent power producers (IPPs) since 1995, the new deregulation is expected to generate much more investor interest in developing IPPs, though progress in this direction has been slower than expected due to weak demand.

Environment.

In recent years Japan has begun to take a more active role in protecting the environment. As air pollution in dense urban areas has persisted, the Japanese government has taken a number of measures to mitigate it, such as encouraging the adoption of low-polluting mass transportation buses and garbage collection vehicles as alternatives to diesel.

The effects of the oil shocks in the 1970s forced Japan to streamline heavy industrial production and reorient its economy toward less energy intensive industries. As a result, while Japanese energy consumption is high, Japan is a world leader in terms of energy efficiency, and a newly revised energy savings law is aiming to reduce the per capita energy consumption in Japan even further.

Japan committed to reducing its total carbon emissions by 6% under the 1997 Kyoto Protocol, but as Japan is the world's fourth largest producer of greenhouse gases, the task ahead is difficult. Japan's economy is heavily dependent on imported oil, but the government is placing increased emphasis on the diversification of its energy sources. In addition to nuclear power Japan is looking to increase its share of solar, hydro, and other carbon-free, non-polluting renewable energy sources. In the 21st century, Japan will need to continue in its role as a leading developer of environmental technologies in order to protect its environment.

AUSTRALIA

Australia is the world's leading coal exporter. Although there is more exploration yet to be done, Australia's proven oil and natural gas reserves have nearly doubled in recent years. The government is currently in the process of developing infrastructure to bring more of Australia's natural gas reserves to market. Australia's growth rate in oil consumption is projected to have a much higher growth rate than Japan's. In spite of being an important producer of crude oil and condensates, in its international trade balance, Australia is a net importer.

Australia has exhibited robust economic growth over the last decade, most recently with a 3.0% increase in real gross domestic product (GDP) in 2003 and a forecasted 3.7% increase in 2004. As a result, Australia is one of the world's fastest growing industrialized countries. Such growth has occurred in spite of weak export demand and a strong Australian dollar that has depressed exports, as well as severe droughts during 2002 and 2003.

Australia's Liberal Party, under Prime Minister John Howard, has led the country since 1996, recently winning reelection on October 9, 2004. During its tenure, the Liberal Party has focused on stimulating

domestic consumption by overhauling the tax system and cutting interest rates. Expansionary fiscal policy, as well as the deregulation of many domestic markets, has fostered significant increases in domestic consumption in recent years.

Australia is an energy resource-rich country with significant petroleum, natural gas and coal reserves. Australia's energy consumption is dominated by coal, which fuels most of the country's power generation. Petroleum also accounts for a large share of energy consumption. Natural gas use is relatively small, but it has been growing rapidly in recent years. As a result of expanding consumption in a period of declining production, Australia is facing growing dependence on petroleum imports. Although foreign investment in the energy sector remains high, many Australians believe that a restrictive regulatory climate and the government's failure to provide incentives for potential investors have lessened further growth. In 2003, for example, several U.S.-based companies made plans to sell their Australian pipeline assets as a result of the regulatory climate.

Australia is one of the few OECD countries that is a significant net energy exporter. It has been the world's largest coal exporter since 1986, and it is the sixth largest exporter of LNG. Australia's prospects for expanding energy exports in the future are promising, as Asian demand for both coal and LNG rises. In the future, Australia can expect increasing export competition from China -- in coal, and Indonesia -- in both coal and LNG. Japan, the largest importer of Australian coal, is considering taxing coal imports to encourage consumption of other fuels. As a result, long term growth of Australia's coal exports is contingent on Asia's response to global warming concerns.

In June 2004, the Australian government issued "Securing Australia's Energy Future," commonly known as the "White Paper," which forecasted that energy demands will grow 50% by 2020. The paper's endorsement of the increased use of coal has been controversial with the Australian public and environmental lobbies, especially since the recently reelected government has made no commitment to ratify the Kyoto Treaty.

Coal.

Australia is estimated to contain 90.5 billion short tons (Bst) of coal reserves, the majority of which are concentrated along the country's eastern seaboard. As a result of several consolidations in recent years, Australia's coal industry is dominated by four companies: BHP Billiton; Anglo American (UK); Rio Tinto (Australia-UK); and Xstrata (Switzerland). The Bowen Basin in Queensland contains the largest reserves (37.8 Bst). Reserves in the Sydney-Gunnedah Basin and surrounding areas of northern New South Wales (NSW) contain about 32.1 Bst. Minor reserves are also located in Southern and Western Australia as well as Tasmania.

Australia is the world's fourth largest coal producer. It exports approximately 60% of its annual production, making it the largest net exporter of coal (28% of global coal exports). Together, Queensland and NSW account for 95% of Australia's annual coal production. While both states produce both coking and thermal coal, production of coking coal is significantly higher in Queensland, while NSW leads in thermal coal production. Over the last decade, coal production in Australia has grown by 4% annually, reaching 378 million short tons (Mmst) in 2002.

Australia is dominant in the market for coking coal, where it is responsible for over half of all world exports. Australia also leads the world in thermal coal exports, although it accounts for a smaller share of that market (around 21%). Australia's thermal coal exports recently began to face new competition from China, raising the possibility that its share of that market may shrink in the future.

Japan is the destination of over 60% of Australia's coal exports, while other important export markets include non-Japan Asia and Europe. As a result, Australian suppliers set prices for their coal exports directly with Japanese utilities. The annually negotiated price of these contracts has a large effect on Australia's coal export earnings. In April 2004, the Australian government announced that Japanese electricity producers could pay up to 70% more for Australian coal as a result of rising demand coupled with limited supply.

Because China is increasing its domestic coal use and Indonesian output was curtailed by heavy rains, Australia is seen as the main source of a currently limited coal supply.

Electric Power.

As of January 2002, Australia had electric generating capacity equal to 45.3 million kilowatts. Approximately 84% of this capacity was thermal (mostly coal) while 14% was renewables (mostly hydro). Coal-fired generating capacity is primarily located in the eastern part of the country near its coal reserves, while Western and Southern Australia rely on natural gas to fuel their power plants. In 2002, Australia generated 210.3 billion kilowatthours (bkwh) of electricity and consumed 195.6 bkwh. The Energy Supply Association of Australia (ESAA) has predicted that consumption will grow rapidly in coming years, rising to 206 Bkwh by 2008, with the majority of growth in consumption concentrated in Queensland, NSW and Victoria.

Prior to 1996, electric utilities were owned independently by states, but 1996 reforms privatized many state-owned utilities. Key to these reforms was the creation of the National Electricity Market (NEM), a wholesale “pool” operated by the National Electricity Market Management Company (NEMMCO). It serves Queensland, New South Wales, Victoria, Southern Australia, and the Australian Capital Territory -- via an interconnected national electricity grid. Tasmania, Western Australia, and the Northern Territories are not members of the NEM, although Tasmania is expected to join by 2005 via the Basslink interconnector, a high voltage direct current (HVDC) submarine cable. In November 2002, the government of the state of Western Australia adopted its own plans for reforming its electricity sector by unbundling the state’s regulated utility, Western Power, and establishing a wholesale power market by 2005.

Consumer reviews of Australia’s electricity reforms vary. Overall electricity prices fell approximately 11% between 1996 and 2000, although the majority of the savings went to large industrial/commercial customers. During 2000 and 2001, the NEM experienced a significant increase in price volatility arising from unusual temperature conditions and supply shortages. As a result, retail competition was introduced to NSW and Victoria in January 2002. Due to overcapacity and strong competition, electricity prices have decreased since the states have been combined into a two-state regional market, although prices have recently begun to rise as increasing demand diminishes spare capacity. In Southern Australia, reforms have led to higher prices following the introduction of retail competition in January 2003. Queensland has indefinitely postponed introducing retail competition, a decision that could be indicative of the provincial government’s reluctance to abdicate its control over the electric power sector.

The NEM has been successful in encouraging new investment: between 2000 and 2002, 3,300 MW of new generating capacity was added. Rapid growth in demand for electricity has nonetheless resulted in shrinking reserve margins in eastern Australia, a problem that could increase by 2005 without sufficient investment in new generating capacity. The prospects for new foreign investment are limited, however, as several U.S. and UK companies with stakes in Australia’s generating assets have recently made plans to exit the industry.

Environment.

Because energy commodities are a major source of export earnings in Australia, development of these resources in a sustainable manner is a primary policy goal of the government. Improving end-use efficiency in various economic sectors remains a key element of Australia’s sustainable energy policy, as does the utilization of renewable energy resources. Australia’s Mandatory Renewable Energy Target (MRET) mandates that an additional 2% of Australia’s power come from renewable sources by 2010. This mandate led to a proposal by Pacific Hydro, the country’s largest renewables company, with a total generating capacity of 112.7 MW, to expand the country’s wind power capacity. In 2003, work also began on the development of Australia’s first geothermal project in the Cooper Basin, estimated to contain an energy resource equal to 50 billion barrels of oil.

In 2002, Australia accounted for 1.7% of the world's total energy-related carbon emissions. Although coal constitutes a major part of Australia's energy mix, increasing urban air pollution levels are more a consequence of automobile usage than coal consumption.

In February 2004, Enviromission announced an optimistic end to a feasibility study concerning the completion of a 200 MW solar tower in Mildura. Following the announcement, in June 2004, the government pledged A\$75 million for "solar cities" trials in urban settings.

INDONESIA

Indonesia is important to world energy markets because of its OPEC membership and substantial, but declining, oil production. Indonesia also is the world's largest liquefied natural gas (LNG) exporter.

Indonesia's economic growth surpassed expectations in 2003, largely fueled by consumer spending. Indonesia's real gross domestic product (GDP) grew at a rate of 4.1% in 2003, up from 3.7% in 2002. Real GDP growth were forecasted to be 4.7% for 2004, although imbalances in the macroeconomic picture, such as increasing budget deficits caused by oil price subsidies on the local market, could lead to future problems.

2003 was the last year of the IMF assistance program designed to pull Indonesia's economy out of the emergency situation that had developed during the 1997/98 Asian financial crisis. In March 2003, the IMF disbursed the scheduled \$469 million tranche of its bailout package after reporting that Indonesia had made good progress instituting reforms. The IMF review cited Indonesia's continued economic growth, decreasing inflation rates, and strengthened banking sector as examples of progress made, while mentioning that more reforms were still necessary. Conditions of the \$43 billion bailout agreement included improving the transparency of government financing and especially the operation of government-owned enterprises such as the state-run PT Pertamina oil monopoly. The government of Megawati Sukarnoputri expressed a commitment to reforms when it took office in 2001, but progress has been limited since then, with the April 2004 ouster of reform-minded Pertamina head Baihaki Hakim renewing concerns – especially among urgently needed foreign investors – that Indonesia's efforts to improve transparency have faltered.

President Megawati has been in power since July 2001, assuming the presidency after her predecessor, President Abdurrahman Wahid, was removed from office by the national legislature. The regional challenges facing the Indonesian government remain the same: a separatist movement in Aceh, an oil and gas rich province in north Sumatra which abuts the strategically important Strait of Malacca; and a separatist movement in Irian Jaya, a gas-rich province at the eastern end of the country. The government is also managing threats posed by an Al Qa'ida-linked terrorist group, Jemaah Islamiyah. Jemaah Islamiyah was responsible for the 2001 nightclub bombing in Bali, a 2003 hotel bombing in Jakarta, and is now targeting Western business and political figures in Indonesia, according to recent reports. Jemaah Islamiyah is seeking to undermine foreign economic interests in the country, according to Western security officials.

Tension exists between the central government in Jakarta and leadership at the regional level. The distribution of oil and gas revenues between the central government in Jakarta and regional governments in areas which produce oil and gas has been regularly disputed. Since Indonesia's transition to democracy in 1999, the country's regional governments have been pressing for a greater share of oil and gas revenues. In particular, the separatist movement in Aceh continues to cause security problems for oil and gas companies in that region, despite the government's energetic offensive against the separatists this year.

Oil.

Indonesia currently holds proven oil reserves of 4.7 billion barrels, down 13% since 1994. Much of Indonesia's proven oil reserve base is located onshore. Central Sumatra is the country's largest oil producing province and the location of the large Duri and Minas oil fields. Other significant oil field development and production is located in accessible areas such as offshore northwestern Java, East Kalimantan, and the

Natuna Sea. Indonesian crude oil varies widely in quality, with most streams having gravities in the 22o to 37o API range. Indonesia's two main export crudes are Sumatra Light, or Minas, with a 35o API gravity, and the heavier, 22o API Duri crude. A study released in August 2002 by Indonesia's Directorate General of Oil and Gas shows that oil reserves in the Cepu block alone, located in Central/East Java, are close to 600 million barrels, about half of which is considered recoverable.

In 2003, Indonesian crude oil production averaged 1.02 million barrels per day (bbl/d), down from the 2002 average of 1.10 million bbl/d and continuing the decline of the past several years. The decline is due mainly to the natural fall off of aging oil fields, a lack of new investment in exploration and regulatory hurdles unlikely to be addressed until after the 2004 elections. Besides crude oil, Indonesia also produces approximately 133,800 bbl/d of natural gas liquids and lease condensate, which are not part of its OPEC quota. Indonesia is the only Southeast Asian member of OPEC, and its current OPEC crude oil production quota is 1.22 million bbl/d.

The majority of Indonesia's producing oil fields are located in the central and western sections of the country. Therefore, the focus of new exploration has been on frontier regions, particularly in eastern Indonesia. Sizable, but as yet unproven, reserves may lie in the numerous, geologically complex, pre-tertiary basins located in eastern Indonesia. These regions are much more remote and the terrain more difficult to explore than areas of western and central Indonesia.

China National Offshore Oil Corporation (CNOOC) became the largest offshore oil producer in Indonesia in January 2002, after purchasing nearly all of Repsol-YPF's assets in the country for \$585 million. Pertamina is a CNOOC partner in each Production Sharing Contract (PSC). However, in 2003 CNOOC's production dropped 20,500 bbl/d, or 17.5%, from its 2002 level.

Companies producing from existing fields are attempting to increase recovery rates and to prolong the life of the fields. Caltex, which has the largest operation of any multinational oil company in Indonesia, undertook a steam injection project at the Duri field on Sumatra, but nonetheless experienced a drop of about 71,000 bbl/d in production in 2003 over 2002. Half of the drop is attributed to natural depletion.

The country's declining oil production could be turned around once the new Cepu field in Java comes online. The field, estimated to hold reserves of at least 600 million barrels of oil, is being developed by ExxonMobil in partnership with Pertamina. However, the two oil giants have been unable to reach an agreement over profit sharing, with Pertamina demanding half the field's output and ExxonMobil demanding that Pertamina cover half the field's production costs. Additionally, ExxonMobil wants Jakarta to extend its technical assistance contract, due to expire in 2010, for 20 years. ExxonMobil officials have indicated that the field could be operational in 2006 and could produce up to 180,000 bbl/d, according to recent reports.

Smaller fields could help boost production numbers if they become fully operational in 2004 and 2005. Unocal's West Seno field, under development offshore from East Kalimantan, is producing 40,000 bbl/d and is expected to produce up to 60,000 bbl/d when the second phase of development is completed in early 2005. ExxonMobil's Banyu Urip field, in Java, is expected to come onstream in 2006, according to the company, and reach its peak production capacity of 100,000 bbl/d soon after. Even with these new fields, though, Indonesia's oil production is not likely to rise markedly, due to the continuing decline of mature fields.

Oil Sector Reforms.

The liberalization of Indonesia's downstream oil and gas sector has been under discussion for several years. In October 2001, the Indonesian legislature passed the much-promoted Oil and Gas Law 22/2001 which limited Pertamina's monopoly on upstream oil development (which requires it to be included in all PSCs) by the end of 2003. Also, Pertamina's regulatory and administrative functions were transferred to other entities, while its regulatory role was spun off to a new body, BP Migas. Reports from foreign firms are that BP Migas is proving to be even less efficient than the original Pertamina entity. Almost four years after the law was

passed, several regulations have still not been finalized and are unlikely to be before a new government is elected in July.

Pertamina maintained its retail and distribution monopoly for petroleum products, until July 2004 when the first licenses for a foreign firm to retail petroleum products were due to be awarded to BP and Petronas of Malaysia. The government is still promising to open the sector to full competition by 2005, although progress has been very slow to date. Political interests with ties to Pertamina are likely reluctant to see the state-run firm lose its assured revenue streams. Pertamina itself was changed to a limited liability company by presidential decree in 2003, and is slated to be fully privatized by 2006.

Indonesia's Ministry of Mines and Energy has taken over the function, formerly carried out by Pertamina, of awarding and supervising PSCs with foreign oil companies. Foreign firms also are to be freed from some of the regulatory approval requirements which they argue hinder their efficiency. One concern foreign oil companies have with the new law is the granting of a limited authority to regional governments to tax oil companies' profits.

Refining.

Indonesia has seven refineries, with a combined capacity of 992,745 bbl/d. The largest refineries are the 348,000-bbl/d Cilacap in Central Java, the 240,920-bbl/d Balikpapan in Kalimantan, and the 125,000-bbl/d Balongan, in Java.

PT Kilang Minyak Intan Nusantara, a joint venture of Al-Banader International Group of Saudi Arabia (40%), China National Electrical Equipment Corporation (40%) and PT Intanjaya Agromegah Abadi (20%), are investing a total of \$6 billion to build two Indonesian oil refineries -- one in Pare-Pare, South Sulawesi and the other in Batam Island, Riau. Both projects are expected to be operational in 2005, with crude refining capacities of 300,000 bbl/d. The refineries will be export-oriented, taking Saudi crude and refining it for sale primarily to the Chinese market.

In January 2004, the state-owned National Iranian Oil Co. and Pertamina announced that they will consider cooperating in a \$1 billion venture to build and operate an oil refinery in East Java. The facility is expected to process up to 150,000 bbl/d of crude oil mainly from the Cepu block, according to local press reports. As of June 2004, however, the feasibility study was still not finalized.

Pertamina has decided to resume construction of the partly built petrochemical facility in Tuban, East Java. The project has been stalled since 1998. By the terms of the agreement, Pertamina will guarantee \$400 million in loans from foreign banks and supply inputs to the plant. Domestic investors in the project include several individuals with close ties to former Indonesian leader Suharto. Pertamina's partnership with Saudi Arabia's Hi-Tech International Group collapsed in 2002, when the Saudi firm failed to raise enough money to finance its portion of the plant. Another attempt to restart the project failed when the World Bank and IMF informed the Indonesian government in 2003 that Pertamina's attempt to finance the project alone, using collateralized revenue from the Cilcap refinery, was forbidden under the terms of their respective lending programs. When complete, the plant is expected to produce 1 million tons of aromatics, 1 million tons light naphtha, and 1.6 million tons of kerosene and diesel annually.

Natural Gas.

Indonesia has proven natural gas reserves of 92.5 trillion cubic feet (Tcf). Most of the country's natural gas reserves are located near the Arun field in Aceh, around the Badak field in East Kalimantan, in smaller fields offshore Java, the Kangean Block offshore East Java, a number of blocks in Irian Jaya, and the Natuna D-Alpha field, the largest in Southeast Asia. Despite its significant natural gas reserves and its position as the world's largest exporter of liquefied natural gas (LNG), Indonesia still relies on oil to supply about half of its own energy needs. About 70% of Indonesia's LNG exports go to Japan, 20% to South Korea, and the remainder to Taiwan. As Indonesia's oil production has leveled off in recent years, the country has tried to

shift towards using its natural gas resources for power generation. However, the domestic natural gas distribution infrastructure is inadequate. The main domestic customers for natural gas are fertilizer plants and petrochemical plants, followed by power generators.

Indonesia is facing a declining share of global LNG markets, despite its past status as the world's leading LNG and dry gas exporter. The decline can be attributed to questions over the reliability of Indonesian supply and lower investment in the Indonesian energy sector. Uncertainties over political support for the sanctity of contracts, regulatory transparency, and unfavorable PSC terms have undermined investment support. As a result, Indonesian LNG exports have been partially replaced by exports from Oman, Qatar, Russia, and Australia on world markets. The sector has also faced restructuring under the terms of Indonesia's World Bank and IMF lending agreements, with BP Migas taking over the supervisory and management roles formerly filled by Pertamina.

Despite Pertamina's reduced authority, the company's key role in the gas sector was reinforced in early June 2004 when BP Migas announced that PT Pertamina has been appointed as the sole sales agent for LNG sales to South Korea and Taiwan. Pertamina will negotiate sales for Total, Unocal, Vico and BP Indonesia. Current contracts with South Korea and Taiwan are due to expire in 2007 and 2009, respectively.

One project that holds tremendous promise for Indonesia's future in worldwide LNG markets is BP's Tangguh project in Papua province (also known as Irian Jaya), based on over 14 Tcf of natural gas reserves found onshore and offshore the Wiriagar and Berau blocks. The project will involve two trains with a combined capacity of 7 million tons per annum (tpa), expandable to 14 million tpa. BP's current plans call for the project to be completed by 2007. Initial planning was stalled when BP lost the bids to supply Guangdong Province and Taiwan in early 2003. However, in late 2003 and early 2004, BP secured supply agreements with Fujian, China for 2.6 million tpa, with leading Korean steel producer POSCO for 1.5 million tpa, and with Sempra Energy for 3.7 million tpa over 15 years to begin in 2007. These supply agreements made possible the \$2.2 billion investment to develop the fields. Talks are underway for BP's Tangguh to supply 5 million tpa to Jiangsu, China beginning in 2007.

The 400-mile Natuna pipeline is one of the longest undersea gas pipelines in the world, bringing gas from blocks operated by Premier Oil, ConocoPhillips, and Star Energy to customers in Singapore. Singapore is a major consumer of Indonesian natural gas, which it uses for its growing electricity generation needs. New pipeline proposals that would link East Natuna with the Philippines are under consideration, but the high financing costs and security concerns in regions to be traversed by the lines make the projects unlikely.

In another possible use for Indonesia's gas resources, Shell is examining the possibility of building a gas-to-liquids (GTL) plant in Indonesia. The plant, if the project goes forward, would produce 70,000 bbl/d of diesel and other middle distillates using the Fischer-Tropsch GTL process.

Coal.

Indonesia has 5.9 billion short tons of recoverable coal reserves, of which 58.6% is lignite, 26.6% is sub-bituminous, 14.4% is bituminous, and 0.4% anthracite. Sumatra contains roughly two-thirds of Indonesia's total coal reserves, with the balance located in Kalimantan, West Java, and Sulawesi. According to U.S. Embassy reports, Indonesia produced 114 million metric tons of coal in 2003, up 11% from 2002. The entire increased production was exported, primarily to Japan and Taiwan, but also South Korea, the Philippines and Hong Kong.

Indonesia plans to double coal production over the next five years, mostly for export to other countries in East Asia and India. The new capacity will come primarily from private mines. The Clough Group of Australia was awarded a \$215 million contract for improvements at the Indonesian firm GBP's Kutai mine in East Kalimantan. Another foreign firm with major interests in Indonesian coal mining is Australia's Broken Hill Proprietary (BHP).

July, 2003 saw the divestment of Australian mining company Rio Tinto and BP from their joint venture in Kaltim Pima Coal (KPC). The shares were sold to Indonesian firm, PT Bumi Resources for \$500 million. According to several reports, the divestment was prolonged and acrimonious as the government objected to Rio Tinto's divestment plan, and threatened to mobilize public action to block the mine's operations. Ultimately, Rio Tinto and partner BP sold their combined 100% stake for about half of its assessed value.

Electricity Generation.

Indonesia has installed electrical generating capacity estimated at 21.4 gigawatts, with 87.0% coming from thermal (oil, gas, and coal) sources, 10.5% from hydropower, and 2.5% from geothermal. Prior to the Asian financial crisis, Indonesia had plans for a rapid expansion of power generation, based mainly on opening up Indonesia's power market to Independent Power Producers (IPPs). The crisis led to severe financial strains on state-utility Perusahaan Listrik Negara (PLN), which made it difficult to pay for all of the power for which it had signed contracts with IPPs. PLN has over \$5 billion in debt, which has grown markedly in terms of local currency due to the decline in the value of the rupiah. The Indonesian government has been unwilling to take over the commercial debts of PLN.

Indonesia is facing an electricity supply crisis, with some observers predicting that PLN may be unable to take on any new customers by 2005. Intermittent blackouts are already an issue across Java. Demand for electrical power is expected to grow by approximately 10% per year for the next ten years. The majority of Indonesia's electricity generation is currently fueled by oil, but efforts are underway to shift generation to lower-cost coal and gas-powered facilities. Geothermal energy and hydropower are also being investigated.

In January 2003, the World Bank announced that it was planning to build three micro-hydropower plants in the Indonesian province of Papua (Irian Jaya). A feasibility study on all of the area's water sources has already been conducted by the Bank, and the results are being studied. By building these facilities, the World Bank hopes to improve services to the local population as well as to encourage development activities in the province.

In October 2003, the World Bank approved a \$141 million loan to Indonesia for the purpose of improving the power sector on Java-Bali, which uses approximately 80% of Indonesia's power generation capacity. The project includes support for a corporate and financial restructuring plan for PLN and technical assistance for a restructuring program for state gas company, Perusahaan Gas Negara (PGN), that will provide for increased natural gas supplies for electricity generation. The restructuring plan requires that PLN must restructure two of its subsidiaries, PT Indonesia Power and PT Pembangkit Jawa Bali (PJB). The two together supply about 80% of the power supply for Java and Bali, according to reports.

Also in 2003, the government renegotiated 26 power plant projects with the IPPs. Of those, five projects will be assumed by the government, in cooperation with PLN and Pertamina. The government foresees inviting private investors to participate in some electricity generation development projects, according to the U.S. Embassy, Jakarta.

Competition for power generation will be open on the islands of Batam, Java, and Bali by 2007. In 2008, retail competition in the electricity market will begin under the terms of the nation's new electricity law, approved in September 2002. The law requires an end to PLN's monopoly on electricity distribution within five years, after which time private companies (both foreign and domestic) will be permitted to sell electricity directly to consumers. However, all companies will need to use PLN's existing transmission network.

Environment.

Indonesia's major environmental challenges involve supporting its large population. Air and water pollution have reached critical levels, especially on the most populated island of Java. Indonesia's carbon emissions remain low, but there is concern that an increase in the use of indigenous coal will increase Indonesia's

carbon emissions in the coming years. Indonesia is well endowed with renewable energy potential, especially geothermal energy. In summary, Indonesia's renewable resources are not yet fully exploited.

In March 2003, the Asian Development Bank approved a \$600,000 grant to help combat Jakarta's air pollution problem. The technical assistance grant will be used primarily to promote a clean vehicle fuel program, known as the "Blue Skies" project. Indonesia is also phasing out the use of leaded gasoline, with a complete ban set to come into force in 2005.

MALAYSIA

Malaysia is important to world energy markets because of its 75 trillion cubic feet of natural gas reserves and its net oil exports of over 300,000 barrels per day.

Malaysia's economy continued its strong growth in 2004, with real Gross Domestic Product (GDP) expanding by 7.1%, up from 5.3% in 2003. The surge in growth was largely due to a rapid expansion of the country's exports, which grew by more than \$20 billion year-on-year. Real GDP growth for 2005 is forecast to slip back to a more sustainable 5.2%.

Malaysia's banking system has been stabilized, after being undermined by a high proportion of nonperforming loans during the Asian financial crisis of 1997-98. The country's banking sector went through a major restructuring in 2000, with many weaker financial institutions being taken over by stronger ones. In order to stimulate the economy, the country's government increased spending sharply in 2001, but in 2003-2004 began to reduce its government budget deficit as a proportion of GDP as demand for exports recovered.

Malaysia has maintained its policy of a fixed exchange rate between the ringgit and the U.S. dollar, which was imposed by Prime Minister Mahathir in September 1998, as part of capital controls designed to stem the outflow of short-term capital in the wake of the Asian financial crisis. Malaysia's currency is considered somewhat undervalued at the present exchange rate of 3.8 ringgits to one U.S. dollar. Some of the capital controls imposed in 1998 were relaxed in early 2001, such as the taxes on repatriation of short-term stock market profits by foreign portfolio investors.

Prime Minister Mahathir Muhammad stepped down in October 2003 after over two decades in office. Abdullah Ahmed Badawi, who had previously served as Deputy Prime Minister, succeeded him.

Oil.

Malaysia contains proven oil reserves of 3.0 billion barrels, down from 4.3 billion barrels in 1996. Despite this trend toward declining oil reserves, Malaysia's crude oil production has risen in the last two years as a result of new offshore development. In 2002, crude oil production averaged 699,000 bbl/d. That figure rose to an average of 750,000 bbl/d for 2004. Total liquids production for 2004 was 855,000 bbl/d, which includes 80,000 bbl/d of natural gas liquids. Malaysia's oil demand has been growing at a much slower rate than its economic output, due to conservation efforts and the conversion of oil-fired power plants to natural gas.

As a result of the long-term trend toward declining oil reserves, Petronas, the state oil and gas company, has embarked on an international exploration and production strategy. Currently, Petronas is invested in oil exploration and production projects in Syria, Turkmenistan, Iran, Pakistan, China, Vietnam, Burma, Algeria, Libya, Tunisia, Sudan, and Angola. Overseas operations now make up nearly one-third of Petronas revenue. Malaysia exports the majority of its oil to markets in Japan, Thailand, South Korea, and Singapore.

ExxonMobil produces about 335 Mmcfd at its offshore Bintang natural gas field in the South China Sea, which contains about 1 Tcf of proven reserves. Commercial production at Bintang began in February 2003.

Malaysia accounted for approximately 14% of total world LNG exports in 2003. After much delay, Malaysia is proceeding with a long-planned expansion of its Bintulu LNG complex in Sarawak . In February 2000, Petronas signed a contract with a consortium headed by Kellogg Brown and Root for construction of the MLNG Tiga facility, with two LNG liquefaction trains and a total capacity of 7.6 million metric tons (370 Bcf) per year, which was completed in April 2003. The Bintulu facility as a whole is now the largest LNG liquefaction center in the world, with a total capacity of 23 million metric tons (1.1 Tcf) per year. Most of the production from the new LNG trains will be sold under term contracts to utilities in Japan. Tokyo Electric Power (TEPCO), Tokyo Gas, and Chubu Electric all import LNG from the project. BG signed a contract in August 2004 for supplies over a 15-year period to the United Kingdom, to begin in 2007 or 2008. Shell brought two additional fields online in 2004, Jintan in March, and Serai in September, both of which feed into the Bintulu export terminal. The two fields added over 1 Mmcf/d to Malaysia 's gas production.

In addition to LNG, Malaysia exports 150 million cubic feet per day (Mmcf/d) to Singapore via pipeline. Surprisingly, Malaysia also is an importer of gas from Indonesia. Petronas signed an agreement in April 2001 with Indonesia state oil and gas company Pertamina for the import of gas from Conoco's West Natuna offshore field in Indonesian waters. The move is being seen as part of a Malaysian strategy to become a hub for Southeast Asian natural gas integration. Deliveries from the pipeline commenced in mid-2003. The pipeline connects to an existing pipeline from the shore to Malaysia's offshore Duyong field, which helped to minimize construction costs.

Electricity.

Malaysia currently has approximately 14 gigawatts (GW) of electric generation capacity, of which 86% is thermal and 14% is hydroelectric. In 2002, Malaysia generated around 67 billion kilowatt hours of electricity. The Malaysian government expects that investment of \$9.7 billion will be required in the electric utility sector through 2010. Much of that amount will be for coal-fired plants, as the Malaysian government has adopted a policy of attempting to reduce the country's heavy reliance on natural gas for electric power generation, with a goal of increasing coal's share of electricity generation to 30% by 2006, and more thereafter.

The largest thermal project under development in Malaysia is the 2,100-MW coal-fired Tanjung Bin project in Johor province. Sumitomo was awarded a \$1.5 billion contract in early 2003 by SKS Power, a Malaysian IPP, for the construction of three 700-MW generating units at the site, with the first unit scheduled to begin commercial operation in August 2006.

In 1994, the Malaysian government granted approval for the massive 2.4-GW Bakun hydroelectric project in Sarawak . Scheduled for completion in 2002, the Bakun Dam had been slated to send 70% of its generated power from Sarawak to Kuala Lumpur through the construction of 415 miles of overhead lines in eastern Malaysia, 400 miles of submarine cables, and 285 miles of distribution infrastructure in Peninsular Malaysia. In addition, expansion plans included a high voltage line south to Johor Baharu and north to Perlis, near the western Thai border. A local company, Ekran, was awarded a turnkey contract to manage the project in January 1995. In 1996, the construction contract went to Sweden 's Asea Brown Boveri (ABB). However, in early September 1997, the Malaysian government announced that it was delaying the project indefinitely, citing an unexpected rise in the dam's cost due to the country's economic difficulties at the time.

In mid-1999, work resumed on the river diversion tunnels, a major component of the project which has since been completed. The Malaysian government has taken control of the project and negotiated financial settlements with the firms involved. The subsea transmission line concept has been abandoned, and the Malaysian government is exploring the possibility of sales of electricity to Brunei and Indonesia . While it had appeared likely that the project would be scaled back from its 2,400-MW capacity, the Malaysian government announced in February 2001 that it had decided to complete the project on its original scale. Bids were received in July 2002 for the main construction work for the dam, and a construction contract was awarded to a consortium of six Malaysian and Chinese companies in March 2003. Current plans call for the 300-MW generating units to be brought online in stages, with the first capacity to come online in 2007. While electricity

demand in Sarawak is modest (currently under 1 GW), the potential to use the electricity to develop a metal smelting industry in Sarawak is largely behind the renewed interest in the project.

Malaysia is considering reforms to its power sector to make it more competitive and to lower costs. Currently, three state-owned utilities dominate power generation and distribution in Malaysia. The market was opened to independent power producers (IPPs) in 1994, and 15 IPPs were licensed, though not all of the projects have yet been built.

Tenaga Nasional Bhd, the main state-owned utility, began in 1999 to divest some of its power generation units. Eventually, Malaysia expects to achieve a fully competitive power market, with generation, transmission, and distribution decoupled, but reform is still at an early stage -- and the exact process of the transition to a competitive market has not been decided. The issue is still under study, and many observers have voiced caution in light of the experiences of other deregulated utility systems.

SINGAPORE

Singapore is a major refining center for Southeast Asia, with refining capacity of nearly double its rate of petroleum products consumption. It is also strategically located near the Strait of Malacca, a major route for oil tankers.

Singapore's strategic location at the entrance to the Strait of Malacca has helped it become one of the most important shipping centers in Asia. The Port of Singapore, the world's busiest in terms of shipping tonnage, is a key component of Singapore's prosperity and economic health. Singapore is also a leader in new biotechnologies, petroleum refining, and the manufacturing of computer components.

Recognizing that Singapore's future growth depends on overcoming resource limitations and a small domestic market, the Singaporean government has vigorously encouraged local firms to regionalize their operations and to invest abroad. The Singaporean government has also undertaken efforts to attract additional foreign investors to Singapore. Prime Minister Goh Chok Tong has identified China, India, and the fellow Association of Southeast Asian Nations (ASEAN) as priority countries in Singapore's regionalization drive. During his 2003 visit to Washington, Prime Minister Tong signed a Free Trade Agreement and a Memorandum of Intent of Cooperation in Environmental Matters. During a brief stop in Singapore by President Bush in late 2003, the United States and Singapore announced a cooperation agreement to enhance joint action in tackling security threats from terrorist groups and the spread of weapons of mass destruction. Singapore is today the biggest U.S. customer in Southeast Asia. Total U.S. investments in Singapore stand now at \$61.4 billion, and U.S. exports to the country stand at \$16.6 billion. More than 1,300 American companies have a presence or regional business headquarters in Singapore.

Singapore continues on its way to full economic recovery after the global economic slowdown and the Asian economic crisis of 1997-98. The country's skilled work force and advanced infrastructure, combined with cost-cutting measures, tax cuts and rent reductions, have attracted investments from more than 3,000 multinational corporations from the United States, Japan, and Europe. Singapore's real GDP rose 1.1% during 2003, and is expected to rise by 5.0% in 2004.

Oil.

Singapore is one of the major petroleum refining centers of Asia, with total crude oil refining capacity of nearly 1.3 million barrels per day (bbl/d). The three main refineries include: ExxonMobil's 580,000-bbl/d refinery, Royal Dutch/Shell's 430,000-bbl/d refinery on Pulau Bukom island, and the Singapore Refining Corporation's (SRC) 285,000-bbl/d refinery. The Asian economic crisis of 1997-98 had a negative impact on Singapore's refining industry, and Singapore's refining companies lost significant business due to declining demand for oil products in the region. While the region staged a recovery from the financial crisis in 1999 and 2000, the construction of new refineries in Singapore's traditional export markets has not picked up. New

refineries in India, particularly the 540,000-bbl/d Reliance Petroleum refinery at Jamnagar, which began production in 2000, have reduced Indian demand for imports of refined products. The Melaka refining complex in Malaysia also has become a competitor. In early 2004, Thailand made clear its intentions to become a regional energy hub with the completion of its Sri Racha oil center. To counter the growing competition to its energy hub status in the region, Singapore in February 2004 announced plans to lower by 50% corporate income taxes on oil companies that do business in the country.

In response to increasing competitive pressures, individual refinery operators in Singapore have been exploring various restructuring measures. For instance, Shell has centralized control of its Asian refining operations in Singapore. Caltex has followed a similar strategy. Other Singaporean refiners, in an effort to boost margins, are exploring approaches ranging from long-run cutbacks to cost cutting. Some owners of refineries in Singapore reportedly have expressed interest in selling their stakes in the near future. It is clear, however, that while there has been a short-term recovery in refining margins in 2003, the overall outlook for Singapore's refiners is still uncertain, with so much capacity being developed elsewhere in Asia.

In April 2004, it was reported that the Singapore Petroleum Company Limited's (SPCL) \$140 million bid to acquire the refinery assets of BP Singapore had been thwarted by fellow shareholder ChevronTexaco subsidiary, Caltex Singapore. SPCL will now pay \$70 million for half of BP's refinery stake in the 285,000-bbl/d SRC, with Caltex purchasing the other half. The revised deal was reportedly completed at the end of June 2004.

Also in April 2004, following a 29-year hiatus, a delegation led by Singapore's Trade and Industry Minister made an official trip to Iran, aiming to build stronger political and business ties between the two nations. The trip came on the heels of visits in February and March 2004 by various Singapore officials to Egypt, Jordan, Bahrain, Qatar and the U.A.E. The general stated purposes of the trips included the establishment of joint free-trade agreements with several visited Middle Eastern countries, and the development of potential markets for Singaporean companies in the energy-rich region.

Petrochemicals.

The rapid growth of Singapore's petrochemical industry has been a direct result of the country's strong base in petroleum refining. A large project to reclaim seven small offshore islands to form a 12-square mile petrochemical complex on Jurong Island is in progress. The project will link Jurong to Singapore Island by a 1.62-mile causeway. The main oil companies involved with the facility include Esso (in Palau Ayer Chawan), Mobil Oil (in Palau Pesek) and Singapore Refinery Company (in Palau Merlimau).

A recent major development in Singapore's petrochemical industry was the start-up in late 2002, of a second naphtha cracker by the Petrochemical Corporation of Singapore and its downstream partners, Phillips Petroleum, the Polyolefin Company, Hoechst, and Seraya Chemicals. In addition, Germany's Messer Group and U.S.-based Texaco in early 2002 built a \$200 million synthetic gas plant on Jurong Island. The synthetic gas is being used for industrial purposes and as feedstock for petrochemical and refining customers on Jurong Island.

Natural Gas.

Singapore imports all of its natural gas, which is mainly used for power generation and as a feedstock for petrochemical production. Natural gas use is rising rapidly, as the Singaporean government promotes policies aimed at reducing carbon dioxide and sulfur emissions, ensuring energy security, and promoting the country as a regional hub for an integrated gas pipeline network. Singapore's Senoko Power currently imports 155 million cubic feet per day (Mmcf/d) of natural gas through a pipeline from Malaysia, its first natural gas supplier. This pipeline was the first transnational natural gas pipeline built in East Asia. With the contract for gas supplies from Malaysia scheduled to expire in 2007, Senoko Power spent the early part of 2004 in continuous discussions with Malaysia's Petronas to extend the agreement.

Singapore has embarked on a diversification strategy to avoid becoming dependent on a single source for gas imports. In January 1999, the Singaporean gas consortium, SembGas, (which consists of SembCorp Engineering, Tuas Power, EDB International, and Belgium's Tractebel) signed an agreement to purchase West Natuna gas from Indonesian state energy company Pertamina. Indonesian gas to Singapore comes via pipelines from two separate fields. Since January 2001, West Natuna has supplied 325 Mmcfd as part of a 22-year deal, while Asamera, in Sumatra, is expected to supply 350 Mmcfd in 2005. Another 100 Mmcfd of natural gas is expected to be delivered via the Asamera pipeline from the ConocoPhillips field to Singapore's Island Power company in 2006.

At the end of 2002, natural gas supplied through pipelines generated 43.5 % of Singapore's electricity, with gas use expected to grow to 60 % of total fuels used for electricity generation in the country by 2006. In December 2004, a month-long interruption of natural gas supplied from Indonesia's West Natuna fields, caused by an undersea pipeline leak, was successfully fixed, and gas deliveries restored.

In addition to natural gas imports from Malaysia and the two pipelines from Indonesia, Singapore has plans underway to build a liquefied natural gas (LNG) import terminal, thereby freeing itself from complete dependence on neighboring states for its gas supply. The Singaporean government announced in September 1999 that it had set aside land at Tuas View for the project. Over the last several years, however, the project has made little progress. While it would have obvious energy-security benefits for Singapore, currently LNG would cost more than piped natural gas. The receiving terminal for LNG deliveries alone is estimated to cost nearly \$1 billion.

Singapore may eventually become important as a regional natural gas hub for Southeast Asia. The idea of a regional gas grid for members of the ASEAN has been under discussion for several years. International links already exist or are under construction between Burma and Thailand, Malaysia and Thailand, and Indonesia and Singapore. Singapore is an ideal location to function as the hub of such a system if it comes to fruition.

Electric Power.

Singapore is in the process of restructuring and privatizing its electric power sector, thus transforming what was a monopoly into a competitive market. Two subsidiaries of state-owned Singapore Power, PowerSeraya and Senoko Power, along with Tuas Power, are currently generating electricity. PowerGrid, another subsidiary of Singapore Power, maintains and operates the country's electricity transmission and distribution system. The Singaporean government currently owns majority stakes in all of these firms through holding companies. The process of privatization has been repeatedly delayed, and plans last year called for the Singaporean government to divest its stakes in the electric utility sector by the end of 2004. Following the end of the final phase of privatization, the six retailers of electricity in Singapore will include Keppel Electric, Sembcorp Power, Tuas Power Supply, Senoko Energy Supply, Seraya Energy and Marubeni International Petroleum.

A regulatory agency for the country's electric utility sector, the Energy Markets Authority (EMA), was created in April 2001. It is working on the details of the privatization process and is studying the possibility of constructing gas-fired generation plants that are designed to operate with diesel in the event of a prolonged gas disruption that could cause electricity disruptions. One of the options examined is to allow more flexible integration of co-generation facilities. Co-generation involves the co-production of steam, which chemical firms use in large amounts, along with electricity.

Natural gas importer SembCorp has already entered the power generation business as an independent power producer (IPP), completing the construction of a 815-megawatt (MW) gas-fired plant under the name SembCorp Cogen. The facility began operation in September 2001. Malaysia's Tenaga Nasional has expressed interest in entering Singapore's power market after deregulation. It would either sell power from its grid in Malaysia to customers in Singapore, or possibly purchase generation assets in Singapore.

Most of the state-owned utilities' generating capacity has been converted from fuel oil to natural gas as it has become available. Most new planned capacity also will burn natural gas. Tuas Power awarded a contract to Mitsubishi in 2001 for two 367-MW combined cycle generating units, which are to be completed in 2006. The current economic slowdown, however, has largely stalled expansion of electricity generating capacity in Singapore.

In December 2003, Sime Darby Berhad (SDB) announced the purchase of a 50% share in Island Power Company's 715-MW natural gas fired combined cycle power project, to be built in Singapore. Island Power is a wholly-owned subsidiary of InterGen, and plans to complete the plant by 2006. Upon completion Island Power will be the first independent power plant to participate in Singapore's deregulating power pool.

Singapore's Energy Market Authority began 2004 by allowing large electricity consumers to begin selling their power offtake back to suppliers for profits in the event of a sharp spike in the wholesale pool price. The change in regulation is part of Singapore's ongoing power liberalization program.

At the end of March 2004, Singapore's biggest electricity producer Senoko Power signed a deal to extend the effective life of its generators for 12 years. The deal with Germany's Siemens involves retrofitting two 425-MW generators with improved technology and carrying out a major upgrade to reduce emissions by 2006.

Merchant Marine.

A total of 859 ships (1,000GRT or over) are registered in Singapore. Of these, 277 of them are petroleum tankers, 87 are chemical tankers and 38 are LNG carriers. There are also about 400 foreign-owned ships registered in Singapore as a flag of convenience. Over the last decade, piracy activities in the area of the South China Sea and the Malacca Straits have presented a growing threat to the shipping and trading activities of regional trading vessels. Singapore and several other regional trading partners have expressed interest in increasing joint commitment to crack down on the activities of the illicit criminal piracy networks.

Environment.

A large group of major refineries in Asia jointly agreed to launch a long-term dialogue with fellow governments on measures to improve environmental conditions. Among some of the growing concerns among East Asian oil importers and producers are the conditions of the transport tankers ferrying fuel deliveries in regional waters. Particular attention in recent years has been devoted to the conditions of the aging Russian and Eastern European ships transversing the waters of East Asia.

TAIWAN

Located across the Taiwan Strait from mainland China (80 miles at the closest point), Taiwan is a leading economic and trading center, with one of the busiest ports in the world (Kaohsiung). As Taiwan lacks sufficient domestic energy sources, it is almost totally dependent on energy imports.

Taiwan's economy in 2004 experienced strong growth, building upon a robust year in 2003. The 3.2% real GDP growth recorded in 2003 reflects the second-quarter dip caused by the outbreak of SARS, but export-led growth and swelling consumer demand are contributing to an expected rate of 5.3% real GDP growth in 2004. Taiwan's economy is heavily oriented toward the manufacturing of consumer electronics products. Growing worldwide demand, bolstered by economic recovery in the United States, as well as growing demand in mainland China for industrial goods pushed the value of Taiwanese exports up around 22% year-on-year in April 2004.

Oil is by far the dominant fuel in Taiwan's energy mix, accounting for 48% of total primary energy consumption. Coal also plays an important role (34% of total energy consumption), followed by nuclear power (9%), natural gas (8%), and hydroelectric power (less than 2%). Taiwan has very limited domestic energy resources and relies on imports for most of its energy requirements. The country's industrial sector accounts for about 42% of total energy demand, but this share is expected to decline slightly, since Taiwan's economy is moving toward newer, less energy-intensive industries. The transportation sector accounts for one-third of total energy demand.

Taiwan was admitted to membership in the World Trade Organization (WTO) in November 2001, concurrently with China's admission. Unlike China, Taiwan has been admitted to the WTO as a "developed country," which imposes more stringent requirements for reducing barriers to foreign competition. Taiwan recently has lifted some restrictions on direct trade with and investment in mainland China, which is expected to significantly increase cross-strait commercial ties in 2005 and beyond.

Oil.

Chinese Petroleum Corporation (CPC), Taiwan's national oil company, is the dominant player in all sectors of the country's petroleum industry, including exploration, refining, storage, transportation, and marketing. However, significant competition began in July 2000 with the opening of a refinery at Mailiao, owned by Formosa Petrochemical Company (FPC), a subsidiary of the private Taiwanese petrochemical firm Formosa Plastics Group. The first phase of production from FPC's Mailiao refinery began in mid-2000 at 150,000 barrels per day (bbl/d), reaching full capacity of 450,000 bbl/d in 2002.

Prior to the construction of the FPC Mailiao refinery, Taiwan imported a significant quantity of refined petroleum products. Now the country's refining capacity exceeds its domestic consumption of petroleum products, making Taiwan a net exporter. Responding to growing fuel demands in the region, as well as a domestic shift away from oil-fired power generation, Taiwan is seeking to export more of its fuel refining production. Taiwan's refining capacity has increased by about 69% during the past 10 years. Tuntex Group, one of the largest developers in Taiwan, plans to construct a refinery at Tainan, in the southwest region of Taiwan, with a capacity of 150,000 bbl/d. Three refineries, Ta-Lin, Kaohsiung and Tao yuan, are all owned by CPC. Together, they have a total capacity of 770,000 bbl/d, according to the Taiwan Ministry of Economic Affairs.

Taiwan's current crude oil production is under 1,000 bbl/d, compared to crude oil consumption of 876,000 bbl/d. Most of Taiwan's crude oil imports come from the Persian Gulf, though West African countries also are important suppliers. To ensure against a supply disruption, Taiwan's refiners are under a regulatory requirement to maintain stocks of no less than 60 days of consumption. Refiner-held strategic petroleum stocks are the norm in Asia, and Taiwan's policy is similar to those of Japan and South Korea.

Taiwan's government has announced plans to further liberalize the petroleum sector. Taiwan's legislature passed the Petroleum Administration Law in October 2001, which removed CPC's quasi-governmental policy implementation functions, and will permit the eventual sale of a majority stake in the firm. In January 2003, the Taiwanese government announced that it would accelerate the timetable for the sale, with the process to be completed in 2004, but this timetable has slipped as well. When privatization eventually moves forward, foreign firms will be allowed to acquire stakes in CPC on an equal basis with domestic investors.

Despite the lack of formal ties between Taipei and Beijing, Taiwan and mainland China have developed a cooperative relationship in the field of energy. CPC and Beijing's state-owned China National Offshore Oil Corporation (CNOOC) signed a deal in 1996 to jointly explore a 5,939-square-mile area in the Tainan Basin of the Taiwan Strait. Taipei officially ratified the deal in March 1998, and the first round of seismic surveys by the two companies was completed in October 1999. A joint venture agreement was signed between the two companies in May 2002, and CPC received approval in March 2004 to open representative offices in Shanghai and Beijing.

Natural Gas.

Besides oil, CPC also is responsible for Taiwan's natural gas exploration, production and imports. Taiwan had net imports of 257 billion cubic feet (Bcf) of liquefied natural gas (LNG) in 2002 -- up almost 8% over the figure for 2001. Indonesia and Malaysia are Taiwan's two LNG suppliers. Total natural gas consumption in 2002 was 287 Bcf.

CPC operates Taiwan's only LNG receiving terminal -- at Yungan, Kaohsiung. CPC anticipates an increase in natural gas demand due to the construction of additional power plants. The government plans to triple LNG consumption by 2010 for environmental reasons, as natural gas is the cleanest burning fossil fuel.

Meanwhile, Taiwan's energy sector market liberalization program has made possible the construction of competing LNG import terminals. Several private Taiwanese and Japanese firms have formed a consortium, Tung Ting Gas, to pursue an LNG regasification project in Tao-Yuan county. Construction of the terminal was started in mid-2001 by Japan's Chiyoda and Taiwan's CTCI, and is scheduled for completion in 2006. A preliminary agreement has been signed with Qatar's RasGas for LNG supplies. Most of the natural gas from the terminal is slated to be used for electric power generation. CPC announced that the construction of its second LNG import terminal in Tatan will be completed around 2009 and will increase Taiwan's LNG importing capacity from 4.5 to 7.5 million tons.

Coal.

In Taiwan, coal is used for electric power generation as well as for the steel, cement and petrochemical industries. Taiwan ceased producing coal in 2000, and its 55.8 million short ton (Mmst) demand is met with imports, with Australia and China as major suppliers.

Electric Power.

Taiwan Power Company (Taipower), the state-owned electric power utility, currently dominates Taiwan's electric power sector. However, Taipower's monopoly status technically ended after a 1994 measure which allowed independent power producers (IPP's) to provide up to 20% of Taiwan's electricity. IPPs are required to sign power purchase agreements with Taipower, which distributes the power to consumers. Regulations issued by the government in July 1998 allow foreign investors to play a greater role in Taiwan's electric transmission and distribution sector. After joining the WTO in 2001-2002, foreign firms were permitted 100% ownership of firms in the sector.

A new electricity law has been under consideration in Taiwan's parliament, the major feature of which is expected to be the privatization of Taipower. Progress. However, progress has been slow, and the legislation is being reworked by the new Democratic Progressive Party (DPP) government, which was reelected in April 2004. Under the basic framework envisioned, Taipower would retain a monopoly on transmission and distribution networks, but Taipower's generation assets would be split into several firms. The planned privatization is to an extent the result of rapidly rising power demand in Taiwan, and Taipower's inability to build sufficient capacity to keep pace with demand, which led to a power crisis during the summer peak-demand months in 1999. The expected date for completion of Taipower's privatization was originally 2001, but several issues, most notably the controversy over nuclear power, have pushed the expected date back to 2006. In June 2004, the Taiwan legislature opposed a measure that would have allowed revenues achieved by the sale of the stake to be used for the privatization project.

At the end of 2002, Taipower controlled a total installed capacity of 31,915 MW, of which 69% was thermal, 16% was nuclear, and 14% was hydropower, according to Taipower's published figures. Taipower retains exclusive control over nuclear and hydropower plants. The government will continue to own these assets after Taipower is privatized. Taipower currently has 4,884 MW of nuclear generating capacity at 3 plants (Kuosheng and Chinshan stations in the north and Maanshan station in the south).

Taiwan's first major IPP, the coal-fired Mailiao plant owned by the Formosa Plastics Group, began operation in 1999. It currently has an installed capacity of 2,400 megawatts (MW) in four 600-MW generating units, and sells about three-quarters of its output to Taipower. A new coal-fired IPP plant, Ho Ping Power Station, began commercial operation of its two 660-MW units in 2002. Ho Ping is a joint venture including Taiwan Cement Corporation and Hong Kong's China Power and Light Corporation. Several other IPP projects have been approved.

In June 2004, Taiwan's Council for Economic Planning and Development (CEPD) approved plans for a 800-MW coal-fired power plant at Changhua in central Taiwan. The plant will be built by Taipower for around U.S.\$1.4 billion and will come online in two stages during 2011. Additionally, Taipower is building a 4,000-MW LNG-fired complex, the Tatan Power Plant, expected to be completed in 2007. However, the facility is likely to be completed before the adjacent LNG terminal becomes operational in 2009, requiring that the plant be run on coal until then.

One major controversy which has affected Taiwan's electric power over the past two years concerns the future role of nuclear power. Taiwan's Democratic Progressive Party government came into office in early 2000 promising to approve only LNG-fired power projects in the future, and to increase LNG's share of Taiwan's power generation to roughly one-third by 2010. This raised the question of what to do about the 2,700-MW Kungliao nuclear power plant, which is currently under construction. The DPP government attempted to terminate the project in October 2000, but action by the legislature and courts forced a resumption of construction in February 2001. The plant currently is scheduled to begin operation in July 2006. After that, the current government does not plan to support additional nuclear generating capacity. Some officials have reportedly started to question the designation of LNG as the "fuel of choice" for electricity generation, due to cost, which might mean the approval of additional coal-fired capacity for incremental demand after the completion of the Kungliao and Tatan projects in 2006.

Environment.

Taiwan currently is grappling with the environmental ramifications of building one of Asia's richest economies through a decades-long commitment to economic growth. Environmental issues include: the pollution of air and water in urban areas, stores of nuclear and toxic wastes, loss of fisheries and coastal ecosystems, and an overall degradation of the country's natural landscape.

Per capita use in Taiwan is on par with several of its neighboring countries in Asia. However, levels of energy intensity levels in Taiwan compared to other developed countries, tend to be relatively high. This is due primarily to the country's heavy concentration of energy-intensive manufacturing industries.

Air pollution in Taiwan is most obvious in Taipei -- the country's capital and largest city. The primary cause of urban air pollution in Taipei is the large number of motorbikes and scooters which are the main source of transportation for millions of the city's residents. Nuclear power plays an important role in Taiwan's energy sector, making up 22% of Taipower's electric generation in 2002.

THAILAND

Thailand is a significant net oil importer. Energy consumption is growing rapidly as a result of strong economic growth.

Thailand's economy has slowed slightly over the past year, but real GDP growth was still forecast at a reasonably strong 6.3% for 2004, down from 6.8% in 2003. During 2004, slower growth in Thai exports was partially offset by a strong year in the tourism sector. Real GDP growth for 2005 is projected at 5.7%. Longer-term annual growth rates are projected in the range of 5%-6%.

The Thai economy is burdened by a relatively weak banking sector with a high proportion of non-performing loans. Delays in the restructuring of corporate debt also have been worrisome enough to prompt warnings from the International Monetary Fund (IMF) and international credit rating analysts. Any worldwide economic downturn could rapidly affect Thailand due to these structural weaknesses.

Thailand's energy sector is undergoing a period of restructuring and privatization. The Thai electric utility and petroleum industries, which historically have been state-controlled monopolies, are currently being restructured.

Oil.

Thailand contains 583 million barrels of proven oil reserves. In 2003, Thailand produced 259,000 barrels per day (bbl/d) of oil, an increase of about 49,000 bbl/d from the previous year. Of that production, only about 96,000 bbl/d was crude oil. Most of the remainder was natural gas liquids (NGLs) and lease condensate. Oil consumption in 2003 was 851,000 bbl/d, up from 843,000 bbl/d in 2002. Demand growth in Thailand has slowed somewhat since 2002, largely as a result of increasing substitution of natural gas in electricity generation and increased use of ethanol in motor fuels.

The oil industry in Thailand is dominated by PTT, formerly the Petroleum Authority of Thailand. PTT Exploration and Production (PTTEP) is the main upstream subsidiary of PTT. Thai Oil, the country's largest refiner, is also controlled by PTT. The company underwent a partial privatization in November 2001, in which 32% of its equity was sold through the Bangkok Stock Exchange. The Thai government still owns a 68% stake in PTT, and does not plan to sell its controlling interest in the near future.

Despite the industry's financial problems, there have been a number of significant recent Thai oil discoveries, most notably offshore in the Gulf of Thailand. ChevronTexaco is investing heavily in developing Block B8/32 in the Gulf of Thailand. ChevronTexaco also reported a new find in July 2004 in Block G4/43, which is adjacent to B8/32. Unocal also is investing in offshore oilfield development, and reported a significant new find in October 2000. Unocal announced in September 2003 that new investments in developing its offshore fields in the Gulf of Thailand should double current production, reaching 40,000 bbl/d by mid-2005. Seven new exploration blocks, including both onshore and offshore acreage, were awarded in May 2003 as a result of the most recent licensing round. Companies receiving exploration rights included ChevronTexaco and China's CNPC.

Refining/Downstream.

Thailand has four oil refineries, with a combined capacity of 703,100 bbl/d. The three main refineries are Shell Co. Of Thailand Ltd. (275,000 bbl/d) located in Rayong, Thai Oil Co. Ltd., in Sriracha (192,850 bbl/d), and Esso Standard Thailand Ltd. (173,500 bbl/d), also located in Sriracha.

The Thai government has been discussing a proposal to attempt to turn the country into a regional processing and transportation hub for the oil industry. One possibility would be amending regulations to create a bonded-processing zone for export-oriented refineries. The targeted export market would likely be cities in south-central China, which are closer to Thai ports than to the Pacific coast of China. Another proposal would see the construction of a pipeline across the isthmus of Kra, allowing oil shipments from the Persian Gulf to East Asia, to bypass the congested Strait of Malacca, possibly with the addition of an export-oriented 500,000 bbl/d refinery at the pipeline's Gulf of Thailand terminal. A feasibility study completed by PTT in July 2004, however, cast doubt on the financial viability of the project.

Thailand also plans to reduce its consumption of petroleum and imports of gasoline additive methyl tertiary butyl ether (MTBE) in the future by promoting domestic production and consumption of ethanol. The Thai government approved a package of tax incentives in December 2000 to encourage more production of ethanol for fuel use, and gasoline containing 10% ethanol is scheduled to be introduced in the greater Bangkok area beginning in December 2004.

Natural Gas.

Thailand contains about 13.3 trillion cubic feet (Tcf) of proven natural gas reserves, of which it produced 685 billion cubic feet (Bcf) in 2002. The country consumed 904 Bcf in 2002, including imports from Burma. Much of the country's natural gas is used for generating electricity. In 2001, Thailand completed its program for the conversion of almost all oil-fired electric power plants to natural gas. Demand for natural gas is expected to rise at a 5%-6% annual rate over the next five years, which represents a substantial revision downward from previous official estimates. Bongkot is Thailand's largest gas field, located 400 miles south of Bangkok in the Gulf of Thailand. Thailand began imports of gas from Burma in late 2000, used mainly at the Ratchaburi power plant. PTT also is in the process of building an extensive natural gas distribution network around Bangkok, which will provide fuel for power plants as well as large industrial consumers.

Thailand's economic difficulties in 1997-1998, which reduced natural gas demand, along with rising domestic production, forced the country to re-examine two natural gas deals signed with Oman and Indonesia. Planned imports of liquefied natural gas (LNG) from Oman and piped natural gas from Indonesia's Natuna gas fields, for which preliminary agreements had been signed in the mid-1990's, were delayed. Development of Thailand's domestic natural gas resources and the imports from Burma are expected to cover anticipated Thai demand for the next several years, though LNG remains a long-term option for Thailand. Thai officials have held preliminary discussions in 2004 with Omani and Iranian officials about possible future LNG projects.

Unocal Thailand is the country's largest natural gas producer, and has continued to increase its production with the development of new reserves. The Pailin gas field, which came onstream in August 1999, added 165 million cubic feet per day (MMcf/d) to Thailand's gas production. Unocal also started production at the Trat field in 1999. Unocal is undertaking a second phase of development at its Pailin field, which will eventually increase its production to around 330 MMcf/d. Overall, Unocal currently supplies around 740 MMcf/d to the Thai market, a figure which the company expects will rise to 1,240 MMcf/d by around 2010.

ChevronTexaco is currently producing about 145 MMcf/d from its offshore Block B8/32. The company has put its estimated gas reserves in the block at 2.5 Tcf, and has plans to expand production in the future to about 250 MMcf/d. Amerada Hess reported a new onshore natural gas find in northeastern Thailand in early 2003, which currently is under development. The company expects to begin production from the Phu Horm field in 2006.

The \$1 billion, 416-mile Thai-Burmese natural gas pipeline, running from Burma's Yadana gas field in the Andaman Sea to an Electricity Generating Authority of Thailand (EGAT) power plant in Ratchaburi province, was completed in mid-1999. A new connecting line also has been built linking Ratchaburi to the Bangkok area, which provides for other uses for imported Burmese gas in addition to the Ratchaburi power plant.

Joint Development Area.

One of Thailand's most active areas for gas exploration is the Malaysian-Thailand Joint Development Area (JDA) located in the lower part of the Gulf of Thailand, and governed by the Malaysia-Thailand Joint Authority (MTJA). The JDA covers blocks A-18 and B-17 to C-19. A 50:50 partnership between Petronas Carigali and Triton Energy Ltd. (now a subsidiary of Amerada Hess) is developing the Cakerwala field in block A-18, while PTTEP and Petronas Carigali also share equal interests in the remaining blocks. An agreement was signed in October 1999 for sales of gas from the block to PTT and Petronas, for use in both Thailand and Burma. PTT has agreed to purchase 390 MMcf/d of gas over 10 years from the Cakerawala field, the first JDA field to come on stream, beginning in 2006. Natural gas deliveries prior to then will be solely to Malaysia. Cakerawala contains estimated reserves of 2 Tcf.

As the project has moved forward, however, it has become controversial in Thailand. The pipeline is to come ashore in Songkla province in Thailand with a connection overland to Malaysia. Strong opposition to the project developed in 2000 among residents of Songkla, who have voiced concerns about the

environmental impact of the project. The Thai government announced a decision in May 2002 to proceed with construction of the pipeline, but on a slightly different route, which will avoid local population centers. Construction began in mid-2003, and the project is scheduled to begin commercial operation in mid-2005.

Other Pipeline Options.

Two other possible international natural gas pipeline options also are under study. Officials from PTT have held preliminary discussions with Vietnamese officials about possible supply of natural gas from the Tay Nam field in Gulf of Thailand via a pipeline into Vietnam 's main industrial center, Ho Chi Minh City . Talks also have been held with Burma and India about a possible pipeline interconnection between the three countries.

Electric Power.

Thailand had 23 gigawatts (GW) of power generation capacity as of January 2002, from which it produced approximately 102 billion kilowatt-hours (Bkwh) of electricity. The decline of the Thai economy as a result of the Asian financial crisis resulted in a decline in domestic demand for electricity of about 3 Bkwh in 1998, before rebounding in 1999. This situation compelled EGAT, the state-owned electricity company, to revise its electricity demand projections. EGAT postponed or delayed a number of projects including: delaying the commissioning of the third and fourth 300-MW thermal units of the Ratchaburi power complex by three years to 2004 and 2005, respectively; postponing the start-up of the second 300-MW thermal unit at the Krabi power plant from 2001 to 2005; and delaying power purchases from three Laotian projects -- the lignite-fired Hongsa project and the Nam Ngum 1-2 hydro projects to 2004 and 2005, respectively. While demand growth has recovered in step with Thailand 's economic growth over the last five years, EGAT decided to lower its planned generating capacity reserve from 25% to 15%, which further delayed the need for additional generating capacity. Now that the country has worked through most of the backlog of projects approved before the financial crisis, several major new power generation projects are again being planned.

The Ratchaburi power plant, Thailand 's largest power project, had moved forward despite the slowdown in power demand growth. The complex eventually will have a capacity of 3,200 MW, including 1,800 MW in six combined cycle gas-fired generators and 1,400 MW in two conventional thermal units that can burn either natural gas or fuel oil. The first combined-cycle unit began operation in January 2000. Ownership of the plant was transferred from EGAT to Ratchaburi Electric Generation in October 2000, and a successful initial public offering of stock was carried out. One other independent power producer (IPP) also began operation in August 2000, Tri Energy, which has a 700-MW plant at Ratchaburi. The company is owned by a consortium including Edison Mission Energy, ChevronTexaco, and local Thai firms.

Several prospective new projects have been approved within the last year. Thai Oil is planning a 1,400 MW gas-fired plant at Sri Racha, adjacent to its existing refinery. It will sell the power generated to EGAT, beginning in 2008. EGAT is planning four new 700 MW plants of its own, two near Bangkok , one in Chachoengsao province in the north, and one to be located in the south near Songkla. These new plants are to begin operation between 2006 and 2009.

The Thai government has stated that it plans to eventually privatize EGAT, but it is still studying the options for structuring the privatization process. The previous privatization scheme was abandoned in March 2004 after labor union protests.

Environment.

Perhaps the most visible environmental side effect of Thailand 's industrial development is the growing problem of air pollution, where thick smoke often chokes city streets in Bangkok . Although traffic congestion has proven to be a difficult problem to tackle, the Thai government has instituted a number of measures to address urban air pollution problems, including phasing out leaded gasoline, and Bangkok 's air quality thus

is improving. Marine pollution is another threat, with increased risks if an offshore gas pipeline linking Thailand and Malaysia proceeds as planned.

Thailand's rate of energy consumption continues to grow at a fast pace. Thailand's carbon emissions have mirrored the growth in energy consumption, doubling between 1990 and 2001. Thailand is a non-Annex I country under the Kyoto Protocol, meaning it is not required to reduce its carbon emissions below 1990 levels by 2008-2012, but, owing to concerns for Bangkok and the country's other low-lying coastal areas in the event of rising oceans due to climate change, the Thai government ratified the agreement in August 2002.

As with other East Asian countries, both Thailand's energy intensity and carbon intensity levels have increased over the past 15 years. Thailand hopes to reduce its carbon intensity by diversifying its fuel share of energy consumption to emphasize more renewable energy sources, chiefly solar power. A number of solar-powered projects are in development, and the Thai government has given incentives for other non-conventional, alternative energy production. Thailand's environmental outlook is improving, especially as the government conducts required environmental impact assessments (EIAs) and allows for more public participation in the development of infrastructure projects. Still, better enforcement of existing environmental laws and regulations will be necessary to boost Thailand's environmental record.

NORTH KOREA

The Democratic Peoples Republic of Korea (North Korea) occupies a strategic location bordering China, South Korea, and Russia. In 1994, North Korea signed an agreement (the "Agreed Framework") sponsored by the United States, Japan, and South Korea to halt its graphite technology nuclear program in exchange for two light water nuclear reactors. In early October 2002, North Korea disclosed to U.S. officials that it had violated the terms of the Agreed Framework by pursuing a nuclear weapons program, and that North Korea considered the agreement nullified.

According to estimates by South Korea's central bank, North Korea's economy, which remains under tight state control (collectivized agriculture and state-owned companies account for about 90% of all economic activity) grew by only 1.2% in 2002, after growing 3.7% in 2001. Strong increases in agricultural, fishing, and mining output contributed to this growth. The modest growth in real Gross Domestic Product (GDP) over the last four years followed a steady economic contraction from 1990 through 1998. While an estimate for 2003 has not yet been released, there are early indications that North Korea's economy may have slowed, largely due to cutbacks in foreign assistance and fuel shipments.

North Korea's communist ideology has been based on the concept of "juche," or self-reliance. Severe economic problems have, however, forced the country to accept international food aid and embark on a series of limited market reforms. Famine in North Korea has reportedly killed hundreds of thousands of people over the last decade. Several governments, including the United States, have provided funding to the United Nations' World Food Program (WFP) for emergency food aid to North Korea.

North Korea has permitted a small amount of foreign investment in recent years, mainly by South Korean firms. According to South Korean figures, South Korea surpassed China in 2002 as North Korea's largest trading partner.

North Korean-South Korean Relations.

In mid-June 2000, the leaders of the two Koreas held their first summit meeting in Pyongyang. The summit led to a joint statement by the two leaders which supported, in general terms, the goal of eventual reunification of the two Korean states, reunification of families divided since the Korean War, and economic cooperation. Developments in inter-Korean relations since 2002 have been mixed. A naval clash near the two countries maritime frontier in June 2002 heightened tensions, but progress has been made in some

areas, such as the commencement of work in September 2002 on clearing parts of the Demilitarized Zone (DMZ) to facilitate possible road and rail links. The current South Korean president, Roh Moo-Hyun has continued a policy of engagement with the North.

United States Economic Sanctions.

The United States announced on June 19, 2000 that it was easing some of the economic sanctions which have been in place with North Korea under the Trading With the Enemy Act since the start of the Korean War in 1950. Licenses are still required from the Treasury Department's Office of Foreign Assets Control (OFAC) for many transactions, and sales of military and "dual-use" items are still restricted. The designation of North Korea as a state supporter of terrorism by the United States also effectively precludes lending by international financial institutions such as the World Bank.

Domestic Energy Resources.

North Korea relies on two domestic sources of commercial energy -- coal and hydropower -- for most of its energy needs. In 2001, coal accounted for about 86% of the country's primary energy consumption.

North Korea's electricity generating capacity is split nearly evenly between coal-fired thermal plants and hydroelectric plants. In 2001, hydroelectric power plants generated about 69% of North Korea's electricity, and thermal plants about 31%. The country's thermal generating capacity is underutilized due to a lack of fuels. The country's total electricity consumption in 2001 was only 58% of what it had been in 1991. The only year-on-year increase in electricity consumption during the entire period from 1992 to 2001 was for 1999 -- and that was only 1%.

As a result of its electricity shortage, the country often experiences blackouts for extended periods of time, and power losses due to an antiquated transmission grid are high. Some hydroelectric facilities are believed to still be out of operation due to flood damage from major flooding in 1996.

The prospect of South Korean help for North Korea's electricity shortage was discussed at the June 2000 summit, and North Korea has been seeking electricity from South Korea since then. A linkage between the electric grids of the two Koreas is one possibility, but it would be of limited immediate value due to the North's poor transmission infrastructure. At present, South Korea has not agreed to supply the North with electricity from its own transmission grid.

Problems with the North Korean coal industry are closely related to the problem with electricity supply. Coal-fired power plants have been running under capacity in recent years, due in part to problems with rail transportation of coal.

Petroleum.

North Korea lacks domestic petroleum reserves, but the West Korea Bay may contain hydrocarbon reserves, as it is considered to be a geological extension of China's Bohai Bay. Offshore exploration concessions previously held by Sweden's Taurus Petroleum, Britain's Soco, and Australia's Beach Petroleum have been allowed to lapse, having failed to find oil in commercial quantities. Petronas of Malaysia has taken over Block A, previously held by Soco.

In November 2001, the North Korean government awarded its first concession for an onshore block to Sovereign Ventures of Singapore, which covers an area in the Tachon-Rajin area near the Chinese border. In September 2002, the company reported that initial seismic survey results had indicated probable oil and natural gas deposits of modest size. Exploratory drilling began in 2003, but no information on results have yet been released.

Norway's Global GeoServices reported in October 2003 that it had signed an agreement for offshore surveys. The company said it intended to begin initial seismic survey work in the first half of 2004.

In the meantime, North Korea must import all of the oil it consumes. Oil accounts for about 6% of total North Korean primary energy consumption, and is mostly limited to non-substitutable uses such as motor gasoline, diesel, and jet fuel. Deliveries of subsidized fuel oil under the Agreed Framework ended in November 2002, after the disclosure of North Korea's nuclear weapons program.

Natural Gas Transportation.

South Korea has held discussions with China, Russia, and BP about the possibility of importing natural gas from Russia's huge Kovykta gas field near Irkutsk. While China would be a major importer of gas through the pipeline, the project could be made more economical by adding a link to South Korea, which currently gets the vast majority of its natural gas by tanker as liquefied natural gas (LNG). North Korea is one possible route for the pipeline link to South Korea, and would be less costly than the subsea alternative. It now appears, though, that the pipeline will reach South Korea via a subsea route, bypassing North Korea. A final decision on the pipeline route was expected in mid-2003, but has been delayed. Another idea which has been under discussion is the possibility of supplying South Korea with natural gas from the Russian island of Sakhalin via North Korea. It could cover incremental demand in the next decade, after the completion of the pipeline from Irkutsk, but would face the same political risk barriers.

Nuclear Energy.

Prior to 1994, North Korea's nuclear program had been a major concern for regional security, since its graphite reactor technology produced fissionable plutonium which can be used in nuclear weapons. North Korea precipitated a crisis in March 1993 when it announced it would withdraw from the Nuclear Non-Proliferation Treaty in 1993. In June 1993, North Korea agreed to "suspend" its withdrawal after talks with the United States.

Under the Agreed Framework negotiated with the United States in October 1994, North Korea had agreed to freeze its nuclear program in exchange for two new pressurized light-water reactors (which are considered less capable of producing weapons-grade plutonium) and 500,000 metric tons per year (about 3.3 million barrels) of heavy fuel oil to meet its energy needs until the first new reactor becomes operational. KEDO, an international consortium led by the U.S. government (with South Korea, Japan, the European Union, and others), was established to implement the agreement. The European Union joined KEDO in September 1997.

Japan signed a contract in May 1999 committing to provide its \$1 billion contribution to KEDO to fund the new light-water reactors, an action which had been delayed by North Korea's missile test in August 1998. The project was expected to cost a total of \$4.6 billion, with South Korea providing the greatest share of funding at \$3.2 billion. The United States and the European Union also had pledged to contribute funds.

Construction of the light water reactors was to be performed under a turnkey contract with KEPCO, which was awarded in December 1999. Initial site preparation work had begun, and the concrete foundation at the site was laid in August 2002. Training of North Korean technicians who were to operate the reactors had begun in June 2002. The project had faced many delays, and the completion date for the first reactor has been pushed back to at least 2008, from an original completion date of 2003. One hurdle the project had faced was the issue of indemnity for potential liabilities created by the plant. General Electric had originally been chosen to supply the generators, but pulled out of the project when the issue was not resolved to its satisfaction. In January 2001, it was announced that a consortium of Japanese firms, led by Hitachi and Toshiba, would supply the generators.

The disclosure by North Korea in October 2002 that it had a clandestine nuclear weapons program called into question the basis under the Agreed Framework for continuing construction of the reactors. On

November 21, 2003, the Executive Board of KEDO, comprised of the United States, Japan, South Korea, and the European Union, made a formal determination that North Korea had not met the conditions necessary for the continuation of the light water reactor project. The project was suspended for a period of one year, beginning December 1, 2003. The future of the project is still to be decided by the Executive Board.

In mid-2005, North Korea has made publicized implications that it will return to the “Six-Party Talks” (China, North Korea, South Korea, United States, Japan, Russia), hosted in Beijing -- but there is no clear forecast for the near future regarding disestablishment of North Korea’s nuclear weapon development program.

RUSSIA (FOCUSING ON FAR EAST DISTRICT)

Russia is important to world energy markets because it holds the world’s largest natural gas reserves, the second largest coal reserves, and the eighth largest oil reserves. Russia is also the world’s largest exporter of natural gas, the second largest oil exporter, and the third largest energy consumer.

In 2004, Russia’s real gross domestic product (GDP) grew by approximately 7.1%, surpassing average growth rates in all other G8 countries, and marking the country’s sixth consecutive year of economic expansion. Russia’s economic growth over the last five years has been fueled primarily by energy exports, particularly given the boom in Russian oil production and relatively high world oil prices during the period.

This type of growth has made the Russian economy dangerously dependent on oil and natural gas exports, and especially vulnerable to fluctuations in world oil prices. Typically, a \$1 per barrel change in oil prices will result in a \$1.4 billion change in Russian revenues in the same direction—a fact that underlines the influence of oil on Russia’s fiscal position and its vulnerability to oil market volatility. The government’s stabilization fund, a rainy-day storage facility for windfall oil receipts that came into effect on January 1, 2004, can help to offset oil market volatility. But as the fund grows (it is currently worth approximately \$16.7 billion), using it to solve social problems or to buy other assets in the Commonwealth of Independent States (CIS) may become more likely.

The Russian government has made decoupling economic growth from commodity exports a priority, and is attempting to restructure and liberalize its energy sector. Nationalizing parts of the energy sector has come at the expense of Russian oil and natural gas producers, who are seeking to grow in a more liberalized marketplace, as well as Russia’s external trading partners, who are pressuring the country to synchronize its policies with those in Western Europe and North America. Key to these efforts will be breaking up the monopolies that control the natural gas and electricity industries.

In the meantime, Kremlin policy makers continue to exhibit an inclination to advance the state’s influence in the energy sector, not to reduce it. Taxes on oil exports have been raised significantly (until a 17% reduction effective February 2005); state-owned export facilities have grown at breakneck pace, while private projects have progressed more slowly or faltered; Rosneft, the state-owned oil company has obtained the 1-million-bbl/d Yukos unit of Yuganskneftegaz; and leading industry figures have come under criminal investigation by Russia’s Procuracy General. However, Vladimir Putin has promised in conversations with foreign heads of state that the past year (2004) would show oil export growth “from all Russian companies.” At the time of publication, estimates of oil exports were still being finalized. Putin has also maintained that Russia has an interest in maintaining fair market value for the commodity and would be willing to work with OPEC to obtain a price level conducive to domestic economic growth.

Oil.

According to the Oil and Gas Journal, Russia has proven oil reserves of 60 billion barrels, most of which are located in Western Siberia, between the Ural Mountains and the Central Siberian Plateau. Approximately 14 billion barrels exist on Sakhalin Island, in the far eastern region of the country, just north of Japan. In the

1980s, the Western Siberia region, also known as the “Russian Core,” made the Soviet Union a major world oil producer, allowing for peak production of 12.5 million barrels per day in 1988 (most of which came from Russia). Following the fall of the Soviet Union in 1991, oil production fell precipitously, reaching a low of roughly 6 million bbl/d, or around one-half of the Soviet-era peak. Several factors are thought to have caused the decline, including the depletion of the country’s largest fields due to state-mandated production surges and the collapse of the Soviet central planning system.

A turnaround in Russian oil output, which many analysts have attributed to the privatization of the industry following the collapse of the Soviet Union, began in 1999. The privatization clarified incentives and increased less expensive production. Higher world oil prices, the usage of technology that was standard practice in the West, and the rejuvenation of old oil fields also helped raise production levels. Others attribute the increase in part to after-effects of the 1998 financial crisis and subsequent devaluation of the ruble.

By 2010, Russia plans to construct five new units at existing facilities throughout the country. The Russian Ministry of Atomic Energy predicts that by 2020 nuclear generation could reach 300 bkwh per year, more than double the 2003 level.

Besides nuclear generation, the Russian government has also made hydroelectric generation a priority, particularly in the country’s Far East, where electricity supply can be problematic.

Transmission and Distribution Sector.

There are seven separate regional power systems in the Russian electricity sector: Northwest, Center, Middle Volga, North Caucasus, Urals, Siberia, and Far East. The Far East region is the only one not connected to an integrated power system. UES, which is 52% owned by the Russian government (Gazprom now has a 10% stake), controls most of the transmission and distribution in Russia. UES owns 96% of the transmission and distribution system, the central dispatch unit, and the federal wholesale electricity market (FOREM). The grid comprises almost 2 million miles of power lines, 93,000 miles of which are high-voltage cables over 220 kilovolts (Kv).

Privatization and Electricity Market Reform.

Currently, wholesale competition and choice of electricity supplier are nonexistent for consumers in Russia, but this will change under the new plan when implementation begins in 2006 at the earliest. In December 2004 Viktor Khristenko, the energy minister, announced a delay of at least 12 to 18 months in the first sale of electricity generation assets, a key part of power-sector reform plans, increasing concerns among foreign investors that the country’s energy reforms are not progressing as originally planned. According to Khristenko, preparing the assets for sale could take until the middle of 2006.

As part of the reform begun in March 2004, Russian President Vladimir Putin signed six bills into law that aim to substantially reform the industry. Under the new laws, tariff rates on the domestic market are to be made more universal instead of geographically-specific by July 1, 2005, and UES is to be liquidated beginning in 2006. UES’s generation and distribution facilities are to be privatized, while the country’s transmission grid is to remain under state control.

The main object of the Russian electricity reform package is to create a generating sector divided into multiple wholesale electricity companies (commonly called “OGKs”), which participate in a new competitive wholesale market. Russia officially launched a partial wholesale market, which is referred to as the “5-15” model, in November 2003. The market, so-named for Russia’s pledge to deregulate 5-15% of the country’s electricity sector, serves as a trading center mostly for UES regional entities. The creation of 10 OGKs, each of which will own portions of the Russian generation sector, is the foundation for the sector’s privatization. Since the Russian government has not decided on a privatization strategy for the OGKs, this pushed the privatization timetable into 2005-2006. Some of these wholesale generation companies have been auctioned

off, even though Gazprom is the company buying the assets. To date, Gazprom has already bought a 10.3% share in UES and a 25% share in Mosenergo (another generation company).

Under the new plan the distribution sector will stay divided into regional monopolies. The new regional distribution companies will function as guaranteed suppliers to all customers. Also, bilateral contracts between generators and customer are and will continue to be mandatory at fixed prices set by the government.

Electricity Exports.

Russia exports significant quantities of electricity to the countries of the former Soviet Union, as well as to China, Poland, Turkey and Finland. UES also has plans to export electricity to Iran and possibly Afghanistan and Pakistan from two hydroelectric stations it is currently building in Tajikistan. There are currently two efforts underway to integrate the Russian and Western European electricity grids. UES is participating in the Baltrel program, designed to create an energy ring of power companies in the Baltic states. Also, the Union for the Coordination of Transmission of Electricity (UCTE), of which 20 European countries are members, has entered into discussions with Russian colleagues over the technological and operational aspects of amalgamating their systems. In October 2003, officials representing Russia and the European Union agreed to develop plans for the full integration of their respective power grids by 2007.

Environment.

In November 2004, Russia ratified the the Kyoto Protocol on climate change. The Protocol now enters into force since it has met the threshold of being ratified by at least 55 countries that account for at least 55 percent of 1990's developed country greenhouse gas (GHG) emissions. The Protocol's targets become legally binding commitments for ratifying countries. Since the fall of the Soviet Union, Russia's GHG emissions have fallen by about a third. Consequently, Russia should not have difficulty meeting its Kyoto target and could earn billions of dollars by selling back the difference between its emissions targets (set in 1990) and its actual emissions.

SOUTH AND SOUTHEAST ASIA REGIONAL ISSUES

The Southeast and South Asia regions are important to world energy markets, containing over 1.4 billion people -- more than one-fifth of the world's population -- as well as rapid energy demand growth. The regions are also major and growing contributors to global emissions of carbon dioxide.

SOUTH ASIA

The South Asian region (Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka) is notable for its large and rapidly growing population (more than one-fifth of the world total). Despite rapid economic growth during the 1990s, the nations in the region have among the lowest per capita incomes in the world. India is by far the largest South Asian country in terms of population, Gross Domestic Product (GDP), and land area, followed by Pakistan and Bangladesh. In 2003, India experienced a growth rate in real GDP of 8.2%, while Pakistan and Bangladesh experienced growth rates of 5.5% and 5.2%, respectively. India's GDP is expected to grow 6.4% in 2004, with Pakistan's growth at 5.1% and Bangladesh's growth at 5.3%.

South Asia is in a period of transition as it strives to implement effective economic, political, social, and legal structures to support sustained growth. The International Monetary Fund (IMF) and the World Bank have arranged several billion dollars in assistance to the region. The IMF has prescribed such measures as cuts in subsidies (especially energy subsidies), deregulation, anti-poverty efforts, and increased privatization in the near future.

Energy Overview.

Economic and population growth in South Asia have resulted in rapid increases in energy consumption in recent years, well above rates seen in the OECD. The Energy Information Administration (EIA) estimates of South Asia's primary energy consumption showed an increase of nearly 64% between 1992 and 2002 (EIA energy statistics include only "commercial" energy sources and not animal waste, wood, or other biomass, which accounts for more than half of South Asia's total final energy consumption). In 2002, South Asia accounted for approximately 4.1% of world commercial energy consumption, up from 2.8% in 1991. Despite this growth in energy demand, however, South Asia continues to average among the lowest levels of per capita energy consumption in the world, but among the highest levels of energy consumption per unit of GDP.

Discounting "non-commercial" sources of energy including animal waste, wood, and other biomass, South Asia's commercial energy mix in 2002 was 46% coal, 34% petroleum, 12% natural gas, 6% hydroelectricity, 1% nuclear and 0.3% "other." There are significant variations within the region. Bangladesh's energy mix, for example, is dominated by natural gas (66.4% in 2002), while India relies heavily on coal (54.5% in 2002). Sri Lanka and the Maldives are overwhelmingly dependent on petroleum (82% and 100%, respectively); Pakistan is diversified among petroleum (42.7%), natural gas (42.2%), and hydroelectricity (10%). The Himalayan countries of Bhutan and Nepal have the highest shares of hydroelectric power in their energy consumption mix at 80% and 31%, respectively, in 2002. South Asian nations are faced with rapidly rising energy demand coupled with increasingly insufficient energy supplies. Most of South Asia is already grappling with energy shortfalls, typically in the form of recurrent, costly, and widespread electricity outages. Because of the economic and political ramifications arising from such shortfalls, improving the supply of energy, particularly the supply of electricity, is an important priority of national and local governments. The countries of South Asia are looking to diversify their traditional energy supplies, promote additional foreign investment for energy infrastructure development, improve energy efficiency, reform and privatize energy sectors, and promote and expand regional energy trade and investment.

Another important implication of rising energy demand in South Asia is its impact on the region's level of carbon emissions. As of 2002, South Asia accounted for 4.8% of global carbon emissions. With the demand for coal in India projected to increase rapidly in the coming decade (from 359 million short tons (Mmst) in 2000 to 430 million short tons (Mmst) by 2010) and the recent introduction of coal into the fuel mix of other countries in the region, a significant increase in emissions in the future is certain.

Oil.

South Asia contains reserves of only 5.7 billion barrels of oil, around 0.5% of world reserves. In 2002, the region consumed around 2.72 million barrels per day (bbl/d) of oil, and produced approximately 0.70 million bbl/d, making South Asia a net oil importer of around 2.0 million bbl/d. The vast majority (around 819,000 bbl/d in 2003) of South Asia's oil production comes from India, whose offshore Bombay High field accounts for approximately one-third of total Indian oil output. Most of the remainder of South Asia's oil production comes from Pakistan (around 62,000 bbl/d in 2003). South Asia's oil imports are projected to more than double by 2020. The Middle East has been and is expected to remain the primary source of South Asian oil imports. In an effort to reduce oil import dependence, a number of South Asian countries have sought to expand domestic petroleum exploration by attracting private and foreign investors. In July 2003, the Sri Lankan government approved the Petroleum Resources Act to allow for private and foreign investment in its offshore oil and gas fields. Similarly, Pakistan recently executed Production Sharing Agreements (PSA) with exploration companies based in France, Malaysia and Austria. India is making attempts to better implement its 1997 New Exploration Licensing Policy (NELP) to increase foreign involvement in exploration, most recently by awarding 15 exploration blocks in February 2004.

Growing demand for transportation fuels and industrial power has been a major factor behind recent growth in South Asian oil consumption. Between 1990 and 2000, South Asian oil consumption -- led by India -- grew by about 75%. India's oil consumption is forecast to grow another 33% by 2010, reaching 2.8 million bbl/d

(up from 2.2 million bbl/d in 2002). In Sri Lanka, where oil is the dominant source of energy, oil consumption roughly doubled between 1991 and 2000. In 2002, Sri Lanka's oil consumption was 75,000 bbl/d. Sri Lanka imports all of its crude oil and uses it largely for electricity generation and transportation. The country has a refining capacity of 50,000 bbl/d. In recent years, Sri Lanka has further increased oil imports in an effort to avoid overreliance on hydroelectricity.

Several recent oil finds in India may reduce import dependence in South Asia. In September 2004, UK oil firm Cairn Energy confirmed the potential of its Mangala field at between 100 and 320 million barrels. Both Mangala and the nearby N-A fields are expected to yield 60,000 to 100,000 bbl/d by late 2007. In early 2004, Cairn Energy discovered another oil reserve in Rajasthan at the N-V-1 well. The find is expected to have reserves of at least 300 million barrels and likely more than 500 million barrels. Such discoveries follow several other finds by Cairn in early 2004.

Refining and Transportation.

In the face of growing oil demand, several South Asian countries have responded with plans to expand their refining and transportation capacities. Since 1998, India's total refining capacity has increased by 86% to 2.1 million bbl/d as of January 2004. India's largest recent project, the Reliance Industries refinery at Jamnagar, began operation in late summer 1999 and has a capacity of 540,000 bbl/d. Jamnagar is the only privately owned refinery in India. In August 2003, Bharat Petroleum Corp. Ltd. (BPCL) announced plans to expand its Mumbai refinery from 180,000 bbl/d to 240,000 bbl/d by late 2004, making it the second largest refinery in India after the Jamnagar facility. Petronet India is in the process of building product pipelines that will add approximately 500,000 bbl/d to the existing 325,000 bbl/d of pipeline capacity, thereby displacing rail as the main mode of transportation for petroleum products.

In Pakistan, the 100,000-bbl/d "Pak-Arab" refinery came online in late 2000, helping to alleviate the country's dependence on refined product imports. Two additional planned refinery projects include a private venture near Karachi and an "Iran-Pak" partnership project near the border with Iran. The "Iran-Pak" project has yet to reach financial closure, however, as a result of Iran's wish for a guaranteed rate of return. If constructed, the two refineries will add an estimated 160,000 bbl/d to Pakistan's refining capacity.

Natural Gas.

In January 2004, South Asia's proven natural gas reserves were estimated at 67.5 trillion cubic feet (Tcf), approximately 1% of the world total, with potentially larger resources suspected but unproven. India's and Pakistan's reserves are roughly equal in size at 30.14 Tcf and 26.83 Tcf, respectively, while the only other South Asian country with reserves, Bangladesh, contains approximately 10.6 Tcf. Foreign energy companies including Shell and Unocal believe that Bangladeshi reserves may be higher than the official figure. The U.S. Geological Survey estimates that Bangladesh contains 32.1 Tcf in additional "undiscovered reserves." If the higher estimates prove to be correct, Bangladesh could become a major gas producer and supplier to the potential market in neighboring India. Unocal announced in March 2004 the end to a proposal for exports of natural gas to India, citing political reasons.

At present, all natural gas production in South Asia is consumed domestically. Natural gas is seen as playing an important part in supplying new power plants in the region and diversifying from expensive oil imports. As a result, natural gas usage has increased rapidly in South Asia over the last decade, growing about 59% between 1992 and 2002. In 2002, the region produced and consumed around 2.1 Tcf of natural gas. Around 42% was consumed by India, 39% by Pakistan, and the remaining 19% by Bangladesh.

Indian consumption of natural gas has risen faster than that of any other fuel in recent years and accounts for approximately 6.5% of the country's energy demand. At nearly 0.9 Tcf in 2002, Indian gas demand is projected in the International Energy Outlook 2004 to significantly and rapidly increase, reaching 2.5 Tcf in 2025. Increased use of natural gas in power generation will account for much of the change. Like India, Pakistan plans to increase the use of natural gas for future electric power generation projects, a move that

will necessitate a sharp rise in production and/or imports of natural gas. Because natural gas is already Bangladesh's primary source of commercial energy, gas exports are a controversial topic within Bangladesh, as many people feel that Bangladeshi gas resources should be used for domestic purposes before exporting.

If long-term projections of rapidly increasing gas demand for South Asia are correct, the region will require significant increases in production and/or imports. Even with expanded production, however, increased consumption of natural gas in South Asia is constrained by the region's inadequate domestic infrastructure. Gas imports would require construction of infrastructure -- either cross-border pipelines or liquefied natural gas (LNG) facilities -- and their success would likewise hinge on the successful construction of domestic gas pipeline infrastructure. A number of such infrastructure projects have been proposed in India and Pakistan.

Although India's Foreign Investment Promotion Board (FIPB) approved 12 prospective LNG import terminal projects, several were delayed or cancelled in 2001 following the government's decision not to extend payment guarantees to power projects which were to have been the largest LNG consumers. An import terminal at Dahej received India's first cargo of LNG in January 2004. Construction on LNG projects in Gujarat and Kerala has proceeded, with completion dates extending through 2007. The nearly complete Dabhol LNG plant was delayed due to a cancellation of the second stage of the Dabhol Power Project and financial concerns. Shell announced in 2004 that it would commission an LNG import terminal in India before 2005, and several other LNG terminals are in planning stages. A recent natural gas find in Burma is also seen as a potential source of supply for India. Bangladeshi officials stated in June 2004 a willingness to consider a pipeline running across Bangladesh from Burma to West Bengal in India.

Pakistan expects recent discoveries, including one in January 2004, to add about 1 billion cubic feet per day (Bcfd) to its natural gas production. In mid-2000 and again in 2001, Pakistan's government stated that it would permit a gas pipeline linking Iranian gas reserves to rival India to cross its territory. Pakistan would earn transit fees for Iranian gas supplied to India and be able to purchase gas from the pipeline itself. While Iran and Pakistan have shown great interest in the project, India has been reluctant to move forward due to continuing political and military tensions with Pakistan. The recent improvement in India-Pakistan relations over the last year has increased interest in the plan.

Pakistan may also be linked into the Dolphin Project, a scheme to supply gas from Qatar's North Dome gas field to the United Arab Emirates and Oman via a subsea link. Although Pakistan has signed an agreement to eventually purchase gas from Qatar, it seems unlikely that Pakistan will be included in the project in the near-term due to financial weakness and uncertainty about sufficient demand growth. A third possible gas pipeline would link gas-rich Turkmenistan with Dalautabad in central Pakistan via Afghanistan and continue into India. Although the governments of Pakistan, Afghanistan, and Turkmenistan have reached an agreement to develop the pipeline, financial and security challenges are likely to prevent its development.

Bhutan, the Maldives, Nepal, and Sri Lanka do not currently produce or consume any natural gas.

Coal.

South Asia contains coal reserves of 95.5 billion short tons or approximately 9% of the world total. Although coal accounts for 43% of South Asia's energy consumption, nearly all of the coal in this region is produced and consumed by India, the only South Asian country with significant coal reserves (93 billion short tons) and the world's third largest coal producer after the United States and China. Pakistan has limited coal reserves of 2.5 billion short tons. Power generation accounts for about 70% of India's total coal consumption, followed by steel and other industries. Despite the fact that Indian coal is generally of poor quality -- i.e., low in calorific content and high in ash -- and primarily located far from major consuming centers, Indian coal consumption is expected to increase to 510 million short tons (Mmst) by 2020, up 42% from 360 Mmst in 2000 and 393 Mmst in 2002. South Asia's carbon emissions are expected to increase sharply in coming years as a result of increased coal consumption.

Coal currently plays a relatively minor role in Pakistan's energy mix (5% in 2002), but the discovery of large volumes of low ash, low sulfur lignite in the Tharparkar Desert in the Sindh province is expected to have a positive impact on consumption levels by fueling large electric power plants. Bangladesh and Sri Lanka have small coal reserves but currently consume almost no coal. Bangladesh began commercial coal production in April 2003 with the opening of the Barapukuria Coal Mine, in part to fuel a proposed coal-fired power plant to be developed with Chinese assistance. The project is expected to produce one million short tons of coal per year, principally for electricity generation. Another possible coal mining project at Khalashpir is under consideration as well. Sri Lanka has also approved the development of its first coal-fired plant (300 MW) on its northern coast but plans to use imported coal for fuel.

Biomass (Non-Commercial Fuels).

As is the case in many developing regions, South Asia continues to rely heavily on biomass (i.e., animal waste, wood, etc.) for residential energy consumption, particularly in rural areas. According to the International Energy Agency (IEA), biomass accounted for about 80% of residential energy consumption in 2000 and will account for 70% of total residential energy consumption by 2020. Because the primary end uses of biomass are cooking and heating, the expansion of electricity access, used primarily for lighting, is not expected to have a significant affect on biomass use in the near future .

In 2002, South Asia generated 642 billion kilowatt hours (Bkwh) of electricity. Of this, around 81% was from conventional thermal power plants, 16% from hydroelectric plants, 3% from nuclear, and less than 1% from "other renewables" (like wind and solar). Also in 2002, India accounted for the vast majority (85%) of the region's electricity generation, followed by Pakistan (11%), Bangladesh (3%), Sri Lanka (1%), Nepal, Bhutan, and the Maldives (1% total). Regional electricity generation is expected to increase significantly in coming years. Natural gas is expected to displace some coal-fired generation in India, although recently there have been delays in importing natural gas. Regardless, the net level of coal-fired generation in South Asia is expected to rise. Hydroelectricity is expected to fuel new generations, primarily in Nepal and Bhutan. Non-hydroelectric "renewable" capacity (i.e., wind, solar, ocean, biomass, geothermal) is small at present, but it is increasing, with solar and wind power considered most promising.

Electricity demand in most of South Asia is currently outstripping supply, and the region is characterized by chronic shortages. Reasons for this situation include: shortfalls in generating capacity; low plant load factors due to aging generators and poor maintenance of equipment at existing plants (plus low-quality coal in many cases); and losses of power due to poor-quality transmission lines and theft. South Asia's rapidly rising electricity demand has heightened the need for additional investment by independent power producers (IPPs). Unfortunately, bureaucratic obstacles and underdeveloped regulatory policies have led to construction delays and foreign investor disillusionment. As a result, many large IPP projects in the region have been delayed or cancelled over the past two years. Electricity rates are widely subsidized in South Asia, and state electricity companies are faced with the challenge of paying IPPs their asking price for power while providing lower rates to their customers. Electricity companies also lose a substantial percentage to theft. The IMF and the World Bank have encouraged liberalization of South Asian power sectors, including the reduction of subsidies.

Discussions have been underway for some time among South Asian nations to develop a regional electricity grid connecting India, Bhutan, Nepal and Bangladesh. Such a grid would lead to increased efficiencies and reduced power generation and transmission costs. Nepal and Bhutan have substantial untapped hydroelectricity potential that could be consumed domestically or exported to India, Pakistan, and Bangladesh.

India accounts for about four-fifths of the electricity generated in South Asia. As of 2002, total generating capacity in India was 120 gigawatts (GW). India generates approximately 84% of its electricity from conventional thermal power plants, around 12% from hydroelectric plants (located mainly in the north and northeast of the country), and 3% from nuclear plants. India is facing serious power supply problems, with the Indian government citing current generation at 30% below demand. Although 80% of India's population

has access to electricity, power outages and brownouts are common. In 2002, India generated 547 BkWh of electricity. The “International Energy Outlook 2004” projects more than a doubling of Indian power demand from 554 BkWh in 2001 to 1,216 BkWh in 2025.

The majority of power generated in India (approximately 55% in 2002) is fueled by coal. Much of India’s new generation is fueled by natural gas, however, and the government has recently taken a long-term interest in expanding the country’s hydropower capacity. The Indian government has a target of capacity additions of 100,000 MW over the next 10 years, but recent events suggest that this target will not be met. Between 1999 and 2001, several foreign IPP projects were canceled as a result of insolvency among India’s State Electricity Boards (SEBs). In June 2003, the government approved an electricity bill to eliminate controls on generation, transmission and distribution and reduce two major problems plaguing the sector: cross-subsidies and high accounts receivable. Many improvements occurring in the electricity sector are as a result of assistance from international organizations including the Asian Development Bank. In May 2004, the new Indian government committed itself to power sector reform, although a June 2004 deadline for open access to transmission lines was postponed.

As of 2002, Pakistan had 18 GW of installed electric generating capacity. Thermal plants (oil, gas, and coal) make up 70% of this capacity, with hydroelectricity constituting 28% and nuclear plants 2%. Pakistan currently maintains excess generation capacity, but because few of Pakistan’s rural areas have access to electricity and less than half of the population is connected to the national grid, significant demand growth is expected in the long term. Rotating blackouts (“load shedding”) are necessary in some areas, and transmission losses are approximately 30% due to poor infrastructure and significant power theft. Pakistan’s total power generating capacity has increased in recent years, due largely to foreign investment in the mid-1990s, but payment problems have discouraged significant new investment. Recent power project developments include completion of the 1,450-MW Ghazi Barotha hydropower project and an agreement with China to develop two 600-MW coal plants in the Sindh province by exploiting coal reserves in Tharkparkar. A new hydro plant, the Kalabagh project, is pending approval as a result of environmental concerns. If approved, the plant will supply 2,400 to 3,600 MW.

Bangladesh maintains 3.6 GW of electricity generation capacity (2002E). As a result, only around 18% of the population (25% in urban areas and 10% in rural areas) has access to electricity, and per capita commercial energy consumption is among the lowest in the world (4.0 million Btu). Because power demand grew over 60% from 1991 to 2000, Bangladesh’s Power System Master Plan (PSMP) foresees a doubling of required generating capacity by 2005 at a cost of \$4.4 billion. Bangladesh generates its electricity mainly at thermal power plants (93%), but also has some hydroelectric dams (7%).

Net electricity consumption in Sri Lanka doubled between 1992 and 2002. To satisfy the growing demand for electricity, the government secured a loan from the Asian Development Bank in late 2002 to expand its electricity infrastructure. In 2002, the country’s installed generating capacity grew to 2.1 GW from 1.6 GW in 2001. The government aims to provide electricity to 80% of the population by 2010. Sri Lanka relies on hydropower for most of its electricity, making it vulnerable to fluctuations in rainfall. In an effort to diversify, the Sri Lankan government is working to attract foreign investors to build independent thermal power plants. A 168-MW combined-cycle power project was recently completed in the southern part of the nation.

Nepal relies almost exclusively on hydroelectricity to meet its power requirements, and at the end of 2002, its installed capacity was 400 MW. Nepal has large untapped hydroelectric potential (estimated at 43,000 MW), which could be developed to provide for the 60% of the population without electricity, as well as for export. In March 2002, the 144-MW Kaligandaki “A” hydroelectric dam began generating electricity. In October 2002, Australia’s Snowy Mountains Hydro (SMEC) signed a memorandum of understanding (MOU) for the development of the 750-MW West Seti hydroelectric dam. It is scheduled for completion in 2005 and will export power primarily to India. Renewable power sources are increasing in Nepal through rural electrification programs which aim to lessen the disparity in electricity access between rural (30%) and urban (90%) areas. The overall quality of Nepal’s electricity infrastructure, however, is low and is frequently a target for attack by Maoist rebels.

Bhutan's hydropower potential is estimated at 30,000 MW. Hydropower is the dominant source of commercial energy for the country and sales of hydroelectricity exports to India provided 45% of the government's revenues and constituted an 11.6% share of GDP in 2001. India's Tata Power Company and the Power Grid Corporation of India Ltd. have formed a partnership to construct the 1,020-MW Tala hydropower project in Bhutan and a 750-mile transmission line to export power produced by the Tala project to New Delhi and surrounding areas of India. The Tala project is scheduled to be operational by 2005.

SOUTHEAST ASIA IMPORTANT ENERGY SUB-ISSUES -- THE SOUTH CHINA SEA

The South China Sea region is the world's second busiest international sea lane. More than half of the world's supertanker traffic passes through the region's waters. In addition, the South China Sea region contains oil and gas resources strategically located near large energy-consuming countries.

The South China Sea encompasses a portion of the Pacific Ocean stretching roughly from Singapore and the Strait of Malacca in the southwest, to the Strait of Taiwan (between Taiwan and China) in the northeast (see the footnote for a more precise definition). The area includes more than 200 small islands, rocks, and reefs, with the majority located in the Paracel and Spratly Island chains. Many of these islands are partially submerged islets, rocks, and reefs that are little more than shipping hazards not suitable for habitation; the total land area of the Spratly Islands is less than 3 square miles. The islands are important, however, for strategic and political reasons, because ownership claims to them are used to bolster claims to the surrounding sea and its resources.

The South China Sea is rich in natural resources such as oil and natural gas. These resources have garnered attention throughout the Asia-Pacific region. Asia's economic growth rates have been among the highest in the world, and this economic growth will be accompanied by an increasing demand for energy. Between now and 2025, oil consumption in developing Asian countries is expected to rise by 3.0% annually on average, with more than one-third of this increase coming from China alone. If this growth rate is maintained, oil demand for these nations will increase from about 14.5 million barrels per day in 2000 to nearly 29.8 million barrels per day by 2025.

Much of this additional demand will need to be imported from the Middle East and Africa. Excluding cargoes bound for South Asia, most of this volume would need to pass through the strategic Strait of Malacca into the South China Sea. Countries in the Asia-Pacific region depend on seaborne trade to fuel their economic growth, and this has led to the sea's transformation into one of the world's busiest shipping lanes. Over half of the world's merchant fleet (by tonnage) sails through the South China Sea every year. The economic potential and geopolitical importance of the South China Sea region has resulted in jockeying between the surrounding nations to claim this sea and its resources for themselves.

SOUTH CHINA SEA TERRITORIAL ISSUES

Competing territorial claims over the South China Sea and its resources are numerous, with the most contentious revolving around the Paracel Islands and Spratly Islands. However, ownership of virtually all of the South China Sea is contested. The disputed areas often involve oil and natural gas resources:

- Indonesia's ownership of the natural gas-rich fields offshore of the Natuna Islands was undisputed until China released an official map with unclear maritime boundaries indicating that Chinese-claimed waters in the South China Sea may extend into the waters around the Natuna Islands. Indonesia responded by choosing the Natuna Islands region as the site of its largest military exercises to date in 1996. Since then, however, drilling in the natural gas fields has proceeded, and China has not voiced a specific objection to their development.

- The Philippines' Malampaya and Camago natural gas and condensate fields are in Chinese-claimed waters. China has not, however, voiced a specific objection to the development of these fields.
- Many of Malaysia's natural gas fields located offshore Sarawak also fall under the Chinese claim, but as with the Philippine gas fields, China has not specifically objected to their development. In July 2002, a new oil discovery by Murphy Oil (working under a contract with state-owned Petronas) about 100 miles offshore from Sabah on island of Borneo rekindled interest in a latent dispute between Malaysia and Brunei over offshore rights. Brunei had asserted a 200-mile exclusive economic zone (EEZ) off its coastline in 2000. Negotiations between the two governments to resolve the issue are continuing.
- Vietnam and China have resolved their dispute over areas in the Gulf of Tonkin to the south of China's Guangdong province. An agreement signed in December 2000 delineated the boundary between their EEZs, opening the way for oil and gas exploration.
- Maritime boundaries in the natural gas-rich Gulf of Thailand portion of the South China Sea have not all been clearly defined. Several companies have signed exploration agreements but have been unable to drill in a disputed zone between Cambodia and Thailand. Overlapping claims between Thailand and Vietnam were settled on August 8, 1997, and cooperative agreements for exploration and development were signed for the Malaysia-Thai and Malaysia-Vietnam Joint Development Areas (the latter effective June 4, 1993).

Most of these claims are historical, but they are also based upon internationally accepted principles extending territorial claims offshore onto a country's continental shelf, as well as the 1982 United Nations Convention on the Law of the Sea.

UNITED NATIONS' LAW OF THE SEA

The 1982 convention created a number of guidelines concerning the status of islands, the continental shelf, enclosed seas, and territorial limits. Among the most relevant to the South China Sea are:

- Article 3, which establishes that "every state has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles";
- Articles 55 - 75 define the concept of an Exclusive Economic Zone (EEZ), which is an area up to 200 nautical miles beyond and adjacent to the territorial sea. The EEZ gives coastal states "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to" (above) "the seabed and of the seabed and its subsoil...".
- Articles 76 defines the continental shelf of a nation, which "comprises the seabed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles...". This is important because Article 77 allows every nation to exercise "over the continental shelf sovereign rights for the purpose of exploring it and exploiting its natural resources".
- Article 121, which states that rocks that cannot sustain human habitation or economic life of their own shall have no exclusive economic zone or continental shelf.

The establishment of the EEZ created the potential for overlapping claims in semi-enclosed seas such as the South China Sea. These claims could be extended by any nation which could establish a settlement on the islands in the region. South China Sea claimants have established outposts on the islands (mostly military) in order to conform with Article 121 in pressing their claims. The Law of the Sea Convention states that countries with overlapping claims must resolve them by good faith negotiation. The use of the Joint Development Area principle, followed in the Gulf of Thailand, is one model that has been successfully used by South China Sea claimants.

REGIONAL CONFLICT AND RESOLUTION

All of the Spratly Islands claimants have occupied some of the islands, and/or stationed troops and built fortified structures on the reefs. Brunei, which does not claim any of the Spratly Islands, has not occupied any of them, but has declared an Exclusive Economic Zone that includes Louisa Reef.

Military skirmishes have occurred numerous times over the past two decades. The most serious occurred in 1974, when China invaded and captured the Paracel Islands from Vietnam, and in 1988, when the Chinese and Vietnamese navies clashed at Johnson Reef in the Spratly Islands, sinking several Vietnamese boats and killing over 70 sailors.

Indonesia has taken the leading role in diplomatic initiatives and cooperative agreements to resolve South China Sea issues, particularly through the ASEAN (Association of Southeast Asian Nations) forum, which has called for the peaceful arbitration of territorial claims. ASEAN includes all South China Sea nations except for China and Taiwan, and has held a number of working groups with China and Taiwan on related issues that have the potential to foster the cooperation and friendship needed to resolve the more contentious issues in the region. Indonesia hosted the first of these workshops in 1990. These issues have also been discussed at the larger ASEAN Regional Forum (ARF), held in conjunction with the ASEAN Post Ministerial Conference, which draws together 22 countries which are involved in the security of the Asia Pacific region, including all ASEAN members.

ASEAN ministers agreed in 1996 that there should be a regional code of conduct for the South China Sea to permit activities such as scientific research and efforts to combat piracy and drug trafficking without invoking the contentious issue of sovereignty. At the ASEAN Summit in November 1999, ASEAN members put forth a general code of conduct for resolving disputes which had been drafted by the Philippines and Vietnam.

Any such agreements would need to involve non-ASEAN members such as China and Taiwan in order to be comprehensive. China, which is a member of the ARF, has argued in the past that the resolution of territorial disputes should be a bilateral issue. However, other ARF members, such as the United States, have argued that all ARF members had an interest in issues affecting the peace and stability of the region, and that the ARF forum was appropriate for discussing these issues. Views on this issue are varied:

- China has begun a dialogue with ASEAN on the idea of a “code of conduct” governing actions by claimants, but progress has been slow. In general, ASEAN members have pushed for specific commitments to refrain from additional occupation of reefs or new construction, which China has favored a more vague commitment to refrain from actions which would “complicate the situation.” In November 2002, China and the 10 members of ASEAN signed a Joint Declaration on the Conduct of the Parties, which pledged to “undertake to resolve their territorial and jurisdictional disputes by peaceful means” without “resorting to the threat or use of force.”
- Malaysian Foreign Minister Syed Hamid bin Syed Jaafar Albar stated that it was his belief that ASEAN nations had agreed that the territorial disputes were an ASEAN issue, and should not be resolved in other international forums.
- Vietnam has had bilateral working groups with China to resolve disputed boundaries in the Gulf of Tonkin (referred to as the Beibu Wan by China, the Vinh Bac Bo by Vietnam) and the Spratlys, as well as land boundaries. The Gulf of Tonkin dispute was resolved in an agreement concluded in December 2000. Vietnam has wanted to include the dispute over the Paracel Islands in any “code of conduct,” but the idea is not supported by other ASEAN members because the Paracels are disputed only between Vietnam and China.
- Malaysia and Brunei have held talks in 2003 on their conflicting EEZ claims, but have not yet reached an agreement. There have been incidents in 2003 in which naval vessels from Malaysia and Brunei have acted (without the actual use of force) to prevent exploration vessels from working in the disputed area.

Oil.

The focus of most attention regarding the South China Sea's resources has been on hydrocarbons in general, and on oil in particular. Oil deposits have been found in most of the littoral (adjacent) countries of the South China Sea. The South China Sea region has proven oil reserves estimated at about 7.0 billion barrels, and oil production in the region is currently around 2.5 million barrels per day. Malaysian production accounts for almost one-half of the region's total. Total South China Sea production has increased gradually over the past few years, primarily as additional production from China, Malaysia and Vietnam has come online.

The fact that surrounding areas are rich in oil deposits has led to speculation that the Spratly Islands could be an untapped oil-bearing province located near some of the world's largest future energy consuming countries. Speculation that the Spratly Islands could have great strategic value has fueled disputes over ownership. In fact, there is little evidence outside of Chinese claims to support the view that the region contains extensive oil resources. Because of a lack of exploratory drilling, there are no proven oil reserve estimates for the Spratly or Paracel Islands, and no commercial oil or gas has been discovered there.

Resource estimates for this region that have been reported in the Chinese press or attributed to Chinese officials vary greatly. Optimistic Chinese estimates of the South China Sea region's oil potential, however, have helped encourage interest in the area, with one report suggesting that the Spratly Islands region could become another Persian Gulf. One of the more moderate Chinese estimates suggested that potential oil resources (not proved reserves) of the Spratly and Paracel Islands could be as high as 105 billion barrels of oil, and another suggested that the total for the South China Sea could be as high as 213 billion barrels. A common rule-of-thumb for such frontier areas as the Spratly Islands is that perhaps 10% of the potential resources can be economically recovered. Using this rule, these Chinese estimates imply potential production levels for the Spratly Islands of 1.4-1.9 million barrels per day (at reserve/production ratios of 15 and 20). The highest Chinese reserves estimate implies production levels that are twice as high as this.

China's optimistic view of the South China Sea's hydrocarbon potential is not shared by most non-Chinese analysts. A 1993/1994 estimate by the U.S. Geological Survey, for example, estimated the sum total of discovered reserves and undiscovered resources in the offshore basins of the South China Sea at 28 billion barrels. Using the same rule-of-thumb, these reserves could yield a peak oil production level for the Spratly Islands of 137,000-183,000 barrels per day, the same order of magnitude as current production levels in Brunei or Vietnam.

Natural Gas.

Though sometimes overlooked, natural gas might be the most abundant hydrocarbon resource in the South China Sea. Most of the hydrocarbon fields explored in the South China Sea regions of Brunei, Indonesia, Malaysia, Thailand, Vietnam, and the Philippines contain natural gas, not oil. Estimates by the U.S. Geological Survey and others indicate that about 60% -70% of the region's hydrocarbon resources are gas.

At the same time, natural gas usage among developing Asian countries is expected to rise by about 4.5% annually on average through 2025 -- faster than any other fuel -- with almost half of this increase coming from China. If this growth rate is maintained, demand will exceed 21 trillion cubic feet (Tcf) per year - nearly triple current consumption levels -- by 2025. Natural gas consumption could increase even faster if additional infrastructure is built. Proposals have been made to link the gas producing and consuming regions of the Pacific Rim region of Asia by pipeline, with the South China Sea geographically central to these regions.

Malaysia is not only the biggest oil producer in the region, it is also the dominant natural gas producer as well, and until recently has been the primary source of growth in regional gas production. The development of natural gas resources outside of Malaysia has been hampered by the lack of infrastructure. Despite this constraint, natural gas exploration activity elsewhere in the region has been increasing. Much of this new

activity had occurred in the Gulf of Thailand, offshore China, in Indonesia around the Natuna Islands, and in Vietnam in the Nam Con Son basin southeast of Vietnam.

As with oil, estimates of the South China Sea's natural gas resources vary widely. One Chinese report estimates that there are 225 billion barrels oil equivalent of hydrocarbons in the Spratly Islands alone. If 70% of these hydrocarbons are gas as some studies suggest, total gas resources (as opposed to proved reserves) would be almost 900 Tcf. If the rule of thumb for frontier areas were applied to these resource levels, the Chinese estimates would imply potential production levels for the Spratly Islands of almost 1.8-2.2 Tcf annually (at common natural gas reserve/production ratios in the region of 40-50). The entire South China Sea has been estimated by the Chinese to contain more than 2,000 Tcf of natural gas resources. As with oil, China's optimistic view of the South China Sea's natural gas potential is not shared by most non-Chinese analysts.

Liquefied Natural Gas (LNG).

The bulk of the world's LNG trade passes through the South China Sea, and LNG shipments through the Sea to Northeast Asian Markets constituted well over half of the world's LNG trade in 2001. Japan is by far the world's largest consumer of LNG, with shipments to South Korea (the world's second largest consumer of LNG) and Taiwan (the world's fifth largest consumer of LNG) accounting for most of the remaining shipments through the Sea.

Shipping.

More than half of the world's annual merchant fleet tonnage passes through the Straits of Malacca, Sunda, and Lombok, with the majority continuing on into the South China Sea (Figure 1). Oil flows through the Strait of Malacca leading into the South China Sea are three times greater than through the Suez Canal/Sumed Pipeline, and fifteen times greater than oil flows through the Panama Canal. Virtually all shipping that passes through the Malacca and Sunda Straits must pass near the Spratly Islands. The other major shipping lane in the region uses the Lombok and Makassar Straits, and continues into the Philippine Sea. Except for north-south traffic from Australia, it is not used as extensively as the Strait of Malacca and the South China Sea, since for most voyages it represents a longer voyage by several hundred miles.

Shipping (by tonnage) in the South China Sea is dominated by raw materials en route to East Asian countries. Tonnage via Malacca and the Spratly Islands is dominated by liquid bulk such as crude oil and liquefied natural gas (LNG), with dry bulk (mostly coal and iron ore) in second place. Nearly two-thirds of the tonnage passing through the Strait of Malacca, and half of the volume passing the Spratly Islands, is crude oil from the Persian Gulf. Oil flows through the Strait of Malacca were 10.3 million barrels per day in 2002, and rising Asian oil demand could almost double these flows over the next two decades.

Northeast Asian nations are heavily dependent upon energy shipments through the South China Sea. More than 80% of the crude oil supplies for Japan, South Korea, and Taiwan flow through the Sea from the Middle East, Africa, and South China Sea nations such as Indonesia and Malaysia. LNG (above) and coal from Indonesia, South Africa, and Vietnam are also shipped via this route. As a result, about two-thirds of South Korean energy supplies, and almost 60% of Japan and Taiwan's energy supplies flow through the Sea.

Piracy.

The large volume of shipping in the South China Sea/Strait of Malacca littoral has created opportunities for attacks on merchant shipping. Oil product tankers have been among the ships attacked, with 1999 targets including the Thai tanker MV Tenyu off the coast of Malaysia, the Singapore-owned tanker Petro Ranger sailing from Ho Chi Minh City to Singapore, the Indonesian tanker MT Atlanta in the Riau Straits off Sumatra, and the Honduran tanker MT 1 off the eastern coast of Malaysia. The three littoral States of the Malacca Strait (Indonesia, Malaysia and Singapore) implemented a coordinated patrol and other counter-measures in the region in 1992.

CONCLUSIONS

SUMMARY OVERVIEW OF ASIA-PACIFIC REGIONAL ISSUES

Supply and Demand.

In the industrialized countries of Asia, oil demand is expected to increase at an average annual rate of 0.5% during the period of 2000-2020, (considerably less than the average annual rate of 1.4% per year from 1970 to 1999). However, it is extremely difficult to project Asia-Pacific energy trends to 2020 with any degree of certainty, partly because the region is a complex mix of developed, developing, and newly industrialized economies -- and has the world's fastest economic growth. China, for example, can be characterized as having as many as 15 separate electricity markets, with some regions having a surplus of electricity, while others are in deficit. From a supply perspective, Asia has a small amount of oil reserves, though the Central Asian States of the former Soviet Union have ample geographic potential. Regional reserves amount to just more than 4% of the world's total. The biggest producers in the area are China, Indonesia and Malaysia. As a region, production is approximately 1/3 that of the Middle East and 1/2 that of North America. Output is expected to increase noticeably between 2000 and 2020, as a result of improved exploration and extraction technologies. India, in particular, is expected to show a modest supply increase this decade, with the Philippines holding promise for substantial new supplies of oil in the next decade.

Continued Prosperity and Growth.

Long-term prosperity is predicted in Asia for several reasons, including a solid workforce, continued banking and financial sector reform, tremendous natural resources and high education levels. Continued growth will require increased energy consumption, with much of the region's new sources of supply being met through oil and product imports from the Middle East. The Middle East remains the heart of the global oil industry, containing over two-thirds of the proven oil reserves and one-third of proven gas. Recent forecasts predict that the oil output of the Middle East could have to increase by over 50% in the next ten years to meet the expected rise in global oil demand. Several observations of Asia's economy, energy industry, and environment provide a context of the importance of the region to the rest of the world in terms of resource consumption and use. Some of these observations pertaining to economic, energy and environmental issues are critical, to include the following:

Pollution.

With rapid growth in the Asian economies over the last two decades, there has also been rapid growth in energy demand and electricity demand, with resulting increases in oil imports and emissions of sulfur dioxide, nitrogen oxides, particulates, and carbon dioxide. This growth is expected to continue over the coming decades, with energy demand expected to grow 25 percent and electricity demand by 37 percent in Asia by 2010. This demand growth, in turn, is projected to result in an increase of 25 percent or some 960 million tons per year in carbon dioxide emissions, as well as huge investment requirements for pollution control equipment.

Increased energy consumption in Asia is indeed leading to local and regional problems of air pollution, including transboundary air pollution. Ten out of 11 cities surveyed in the region have dangerous levels of suspended particulate matter that exceed World Health Organization guidelines by more than a factor of two. The main source of industrial energy in Asia is fossil fuel, which contributes substantially to air pollution.

Economic.

60% of the world's population today is in Asia, or 3.5 billion people. By 2025, that number will grow to 5 billion, a 40% increase. Last century, when the world's population tripled, energy and natural resource consumption grew ten-fold (with much of that consumption based on the combustion of fossil fuel). In Asia -- by 2025 -- resource consumption, infrastructure development and service delivery will have to increase by 40% simply to maintain the status quo. Asia will remain the world's fastest growing regional economy to 2020. By 2020, 54% of Asians will live in urban areas. Finally, while there are 10 "megacities" in Asia today (10 million residents or more), this may rise to 20 by 2025.

Energy.

The use of conventional energy like oil, coal and electricity has increased enormously in the last 25 years in Asian economies. During the 1980s consumption more than doubled, with an average annual growth rate of 7%. A majority of the Asian economies are in an industrialization phase, which increases their energy intensity.

Environment.

In most Asian economies the CO₂ emissions per capita are still quite low compared with most of the industrialized countries like the United States. However, of the 15 most polluted cities on Earth, 13 are in Asia. The development of energy sectors in Asia is to an increasing extent based on fossil energy use. There seems to be more fuel switching towards more carbon intensive production than to less carbon intensive production. (This type of development is mainly due to the fact that the Asian countries are industrializing economies and are following the Western pattern of development.) CO₂ emissions will consequently increase due to the increase use of fossil fuels. Increased use of natural gas instead of oil and coal will, however, decrease the carbon intensity of energy production. Renewable energy sources such as hydro, wind and biomass-based production provides another possibility towards a more sustainable energy future.

FINAL THOUGHTS

By 2020, many Asian countries and groups of countries will probably play an even greater role in energy markets than they do today. The Central Asian States of the former Soviet Union, for example, may -- as a bloc of nations -- become a formidable competitor with OPEC for markets, capital and technology innovation. In fact, the region is now in the process of creating its own "Eurasian Economic Community," modeled after the European Union (EU).

FOR BACKGROUND PURPOSES -- ENERGY CHRONOLOGY for 2005

Sources include: *Associated Press (AP)*, *Agence France Presse (AFP)*, *Dow Jones (DJ)*, *Japan Times*, *Los Angeles Times (LAT)*, *Minerals Management Service (MMS)*, *New York Times (NYT)*, *Oil Daily (OD)*, *Reu*

January 2005

January 1 The EU launches the European Emissions Trading Scheme (ETS), the first greenhouse gas emissions trading market in Europe (the other is the Chicago Climate Exchange), which links energy-intensive industries to carbon dioxide emissions limits. Four EU countries are not participating, as they are still in the process of agreeing on their national carbon dioxide targets. The market allows firms to sell any unused carbon allowances or to buy extra allowances if needed. The firms participating encompass 50% of total European carbon dioxide emissions. (WMRC)

January 3 Sinopec, a Chinese oil company, finds a sizeable oil and gas field in the remote province of Xinjiang in northwest China. The company estimates the Tahe field in the Tarim Basin contains almost 8 billion barrels of oil and over 2 trillion cubic feet of natural gas. Experts estimate that crude oil reserves from the new find could reach as high as 19 billion barrels. Based on the lower estimate of 8 billion barrels, the new find could represent over one-third of China's proven oil reserves. The beginning of gas production in the Kela-2 field in late 2004 is already expected to turn the Tarim Basin into the country's largest gas producing region in 2005. (Reuters, WMRC).

January 7 India Oil Company (IOC) and Gas Authority of India Ltd (GAIL) sign a deal with the National Iranian Gas Export Corporation to buy 7.5 million metric tons per year of liquefied natural gas (equivalent to approximately 365 billion cubic feet of natural gas) beginning in 2009 and to participate in three oil and natural gas blocks. The IOC and GAIL will participate in Iran's Yadavaran and Jufeyr oil fields. (Reuters).

January 27 Yukos, Russia's top oil exporter last year, is left off of Transneft's export schedule for February, leaving newly enlarged state oil firm Rosneft to fill the export shortfall. Yukos will ship its entire oil output of around 600,000 bbl/d to domestic refineries and will have no spare crude oil for exports. Yukos shipped approximately 680,000 bbl/d in December 2004, a 30% decline from its November export level. (Reuters)

January 30 OPEC decides to leave its crude oil production quotas unchanged at 27 million bbl/d after a meeting in Vienna. The current OPEC president, Sheik Ahmad Fahd Al-Sabah of Kuwait indicates that the producers will reduce their production levels before the next meeting, scheduled for March 26, if prices fall. OPEC also temporarily suspends its price band of \$22 - \$28 per barrel, which had been in effect since March 2000. (NYT, AP)

February 2005

February 1 The U.S. Senate confirms Samuel Bodman as the new Secretary of Energy, replacing Spencer Abraham. (Reuters, NYT)

February 11 Russia's natural resources ministry announces that foreign companies without at least a 51% Russian share will be barred from bidding in several upcoming key auctions for large mineral deposits during 2005. Large deposits open for bidding this year include crude oil and natural gas fields around Sakhalin Island, the Barents Sea, and the Arctic. The Natural Resources Ministry clarifies that international oil companies (IOCs) will still be allowed to participate in the development of these projects, but that the government will require that they be controlled from Russian territory. (WMRC, NYT)

February 14 Australia offers its first new type of major crude oil cargo in four years. The new crude oil type being produced, Mutineer-Exeter, will increase Australia's crude oil production by 100,000 bbl/d at its peak (an increase of around 20% from current production levels). At least one 600,000-barrel crude oil cargo from the field will be available for export each month. (Reuters)

February 16 Eight years after it was first negotiated, the Kyoto Protocol on climate change goes into affect. Following Russia's approval of the treaty in November 2004, the treaty's signatories comprised the requisite 55% of world greenhouse gas emissions in order for it to take effect. One of the Protocol's main goals is to achieve a reduction in greenhouse gas emissions of the six designated greenhouse gases to 1990 levels by 2012. A total of 140 countries have ratified the pact, the first major international effort to reduce industrial emissions. The Bush Administration announced three years ago that the United States would not join the accord, but it would instead pursue other voluntary reduction programs. (Reuters, NYT, LATimes)

February 25 An affiliate of ChevronTexaco signs a \$1.1 billion deal with South Korea's Daewoo Shipping and Marine Engineering to build a giant floating platform at the Agbami field, 45 miles off of Nigeria's coast. ChevronTexaco hopes to produce 250,000 bbl/d from the field. Other partners in the project include Petroleo Brasileiro Nigeria Limited, Statoil Nigeria Limited, Famfa Oil Limited, and the state-owned Nigerian National Petroleum Corporation. (AFP)

March 2005

March 1 A \$700 million natural gas pipeline between southern Thailand and northern Malaysia starts commercial operations on Tuesday after five years of delays. The 227-mile pipeline began a trial delivery period in January with a flow of 5.3-7.0 billion cubic feet per day (bcf/d). Environmental groups, fishermen, and villagers, who lobbied for a change in the pipeline route, stalled approval of the pipeline for three years. (Reuters)

March 23 Widespread power blackouts affect the southern Chinese provinces of Guangdong , Guangxi , Guizhou , Yunnan and Hainan due to a lack of coal and hydroelectric power capacity. Around 30 generation plants in southern China are unable to meet their generation quotas, leaving the region short by 3,000 MW. Chinese press reports expect the blackouts to continue until the end of April. (WMRC)

March 29 After over a year of uncertainty about the status of the Kashagan oilfield in Kazakhstan , KazMunaiGaz, the National Oil and Gas Company of Kazakhstan and Agip KCO sign an agreement for KazMunaiGaz to obtain an 8.33% share in the North Caspian Project, which includes Kashagan. The Agip KCO consortium purchased the entire BG stake of 16.67% for \$1.8 billion. The field is the world's largest oil find in the past 30 years, with estimated reserves of 9-13 billion barrels of oil. (APS Review, Reuters)

April 2005

April 11 TNK-BP, a 50%-50% joint venture of British Petroleum and a Russian oil company, announces the government has issued it a back-tax bill of almost \$1 billion for 2001, over six times higher than the company's previous bill for the same time period. For context, Russian oil company Yukos' tax bill was for almost \$27.5 billion. Although BP will pay the tax bill, Lord Brown, the BP chairman, later meets with Russian President Vladimir Putin to seek reassurances that the Russian energy sector will remain open to foreign involvement. (WSJ, Reuters)

April 12 Russia, Bulgaria and Greece give political support to a \$750-\$800 million trans-Balkan oil pipeline that will allow Russian crude oil to bypass the congested Bosphorus and Dardanelles straits in Turkey. Ministers from the three states sign a memorandum for construction of the 178-mile pipeline, linking Bulgaria's Black Sea port of Bourgas with the northern Greek town of Alexandroupolis on the Aegean Sea. The pipeline will have an initial capacity of 300,000 bbl/d that will eventually rise to 700,000 bbl/d over 3 years. (Reuters)

April 12 China National Offshore Oil Corp. (CNOOC) acquires a 16.69% stake in Canadian oil sands developer MEG Energy for approximately \$120 million. This is the first oil sands deal in Canada by a Chinese oil company. Later during the month, Enbridge , Canada 's second largest pipeline company, announces an agreement with PetroChina on the development of a \$2 billion pipeline project to move petroleum from northern Alberta to Canada 's West Coast. (EI Energy Compass)

April 26 Indonesia offers incentives for oilfield operators to continue development of marginal reserves, in an attempt to stop further declines in the country's oil output. Eight operators who surrendered rights to 30 marginal fields will be offered the chance to take advantage of a 120% cost recovery for development work in the marginal areas, and a 20% rise on cost recovery available under regular production-sharing contracts (PSCs). The 120%-cost-of-recovery incentive will be withdrawn if the rate of return improves to 30% (currently under 15%). BP Migas, the Indonesian upstream regulatory agency, expects the incentives to quickly help improve petroleum production by 100,000 bbl/d and to restore petroleum production to around 1.3 million bbl/d by 2009. Indonesia currently produces approximately 950,000 bbl/d of crude oil. (Platts, WMRC)

May 2005

May 6 India announces that it will begin construction of a strategic oil reserve in early 2006. The project consists of two storage facilities in the south of the country holding enough crude oil to meet the country's needs for two weeks. The government expects to finish the project by 2010. Crude oil imports represent over 70 percent of India's crude oil consumption. (DJ)

May 12 Indonesia's energy ministry announces that the country will likely not develop the Donggi liquefied natural gas (LNG) export terminal. The country originally planned to bring the project onstream in 2008, but a combination of increased domestic natural gas demand and disappointing reserve finds in the Donggi block have raised doubts about the project. Indonesia is the world's largest LNG exporter. (DJ)

May 16 Taking advantage of strong crude oil prices, Russia repays early some \$15 billion in debt owed to the Paris Club. The repayment is the single-largest in history to the group, which includes 18 of the world's largest economies. The Russian government also establishes a budget-stabilization fund financed by oil revenues, with an initial deposit of \$30 billion. Russia is the world's second-largest crude oil producer, after Saudi Arabia, and rising oil prices during the last year have dramatically increased the size of the state treasury. (WSJ)

May 18 The Kazakh parliament passes a law concerning production-sharing agreements (PSA) for new, offshore oil projects. The law stipulates that foreign participation in any project will be limited to 50 percent and requires all projects to provide a certain amount of oil to domestic refineries. The new PSA framework will govern a planned licensing round that will offer up to 200 blocks in the Caspian Sea. Kazakhstan produces about 1.1 million bbl/d of crude oil, and the government hopes that it can triple this amount by 2015 through aggressive exploration of its offshore resources. (DJ)

May 25 An explosion and resulting fire at an electrical substation causes a massive power blackout in Moscow. Record heat and high levels of system utilization are blamed for the outage. Government officials estimate that some 2 million people lost power, with tens of thousands being trapped inside the subway. (WP)

Further Background:

ENERGY CHRONOLOGY for 2004

January 22, 2004 U.S. Interior Secretary Gale Norton approves a plan to open parts of Alaska's North Slope to oil exploration and drilling. Nine million acres of Alaska's National Petroleum Reserve will be opened to long-term production. The site lies adjacent to the Arctic National Wildlife Refuge, which remains closed to oil and gas drilling. (WP)

February 25 Total (France) and Petronas (Malaysia) sign an estimated \$2 billion agreement with the National Iranian Oil Company to build Iran's first liquefied natural gas (LNG) export facility. The two-train facility will have a capacity of 390 billion cubic feet per year, with natural gas to come from Iran's South Pars field. Production of LNG is expected to begin in 2009. Iran holds the world's second largest natural gas reserves—after Russia—and development of LNG facilities would allow the country to export gas around the world. (WMRC)

June 3 OPEC Ministers meeting in Beirut agree to raise OPEC production quotas by a combined 2 million barrels per day effective July 1 and a further 500,000 barrels per day effective August 1. This will bring the combined quota in August for the 10 OPEC countries participating in the quota system (Iraq does not participate) to 26 million barrels per day. Crude oil prices fall somewhat in response to this news. OPEC is scheduled to meet again on July 21 to review this decision. (AP)

July 15 OPEC agrees to raise its crude oil production target by 500,000 barrels (2% of current OPEC production) by August 1—in an effort to moderate high crude oil prices. (WSJ)

July 22 Yukos, one of Russia's largest crude oil producers, warns that it could go bankrupt within three weeks because of the government's decision to freeze its assets and bank accounts, jeopardizing the operations of Russia's largest oil producer and potentially disrupting the company's exports to world markets (WP)

August 9 The Russian government disregards the August 6 ruling of a Moscow court and seizes the main production unit of Yukos, Yuganskneftegaz. On August 6, the court had declared that the Russian government's seizure of Yuganskneftegaz was illegal, a decision which had marked the first major court victory for Yukos since Russian authorities began proceedings against the company more than a year ago. Furthermore, on August 5, the government had unexpectedly withdrawn permission for Yukos to use its financial assets to continue operations, reversing a decision made 24 hours earlier. (WP, WSJ)

October 28 After its approval by the Russian cabinet and the lower half of the Russian legislature earlier in October, the upper house of the legislature ratifies the Kyoto Protocol global climate treaty and returns it to the executive branch for its approval. Russian ratification is necessary for the Protocol to take effect because participating countries must have been responsible for 55 percent of global emission in 1990, and Russia is the only remaining country that can trigger the 55 percent threshold. One of the Protocol's main tasks is to implement a reduction in emissions of the six greenhouse gases to 1990 levels by 2012. The Bush administration announced three years ago that it would not join the accord. (WP, USA Today)

November 22 Ukraine holds a run-off presidential election between Prime Minister Vladimir Yanukovich and opposition leader Vladimir Yushchenko. Although exit polls show large-scale support for Yushchenko, initial official results show Yanukovich with a 2% lead. Massive opposition-led protests ensue in Kiev in what is commonly referred to as the "Orange Revolution". Ukraine is a pivotal transit state for Russian oil and natural gas exports to continental Europe, as well as a major regional producer of coal. Yushchenko later wins a third runoff election at the end of December 2004. (NYT, AP)

December 18 Yuganskneftegaz, the largest subsidiary of Yukos, is auctioned off to a previously unknown company called Baikal Finans Group (BFG) for a well-below-market value of \$9.4 billion. The unit is being sold to help cover more than \$27 billion in tax claims the Russian government says it is owed by Yukos over the last year -- part of a broader campaign against the company and its founder, Mikhail B. Khodorkovsky. Under threat of having the government auction its largest oil asset, Yukos filed for bankruptcy in a U.S. court in Houston, Texas, earlier in the week. In response, many banks that were preparing to back Gazprom in its bid for the oil unit dropped their support. Russian state-owned oil company Rosneft buys all of BFG five days later. (WSJ, NYT)

December 26 The world's largest earthquake in 40 years triggers a devastating tsunami centered in the Indian Ocean affecting largely populated coastal areas of India, Sri Lanka, Malaysia, Indonesia, and Thailand. Almost 300,000 local residents and tourists are killed in the tidal waves, yet damage to energy infrastructure is limited. Relief aid flows into the area from all over the world, increasing the value of local currencies. (NYT, WP, AP, Reuters)

December 31 The Russian government gives its long-awaited final approval for a major oil pipeline to the Pacific port of Nakhodka that would allow for exports to Japan and the western United States. The decision to move ahead with the Nakhodka pipeline rules out a proposed line to Daqing, China; however some concessions to China are expected. State oil pipeline monopoly Transneft will build a 1.6-million-bbl/d capacity pipeline from Taishet in East Siberia to the Perevoznaya Bay in the Pacific Primorsk region. The government gives no firm timeframe for the project, but says final proposals should be made before May 2005. (Reuters)

Sources for this Appendix include:

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5. Global Insight Asia Economic Outlook
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7. Petroleum Intelligence Weekly
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18. Taipei Economic and Cultural Office – Information Division
19. American Institute in Taiwan
20. Taipei General Information
21. Taiwan Power
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